SREP FUNDING PROPOSAL **Project Approval Request**			
1. **Country/Region**:	*Vanuatu*	2. **CIF Project ID#**:	(Trustee will assign ID)
3. **Program Title:**	*Energy Access Project*		
4. **Type of SREP Investment**	*Private:*	*Public: X*	*Mixed:*
5. **Funding Request (in US million total) for Project:**	*Grant: USD 7,000,000*	*Loan:*	
6. **Approved Preparation Grant[1]**	*Amount (USD):*	*Date: October 2015*	
7. **Implementing MDB:**	*Asian Development Bank (ADB)*		
8. **Other MDB Involvement**	*MDB: n/a*	*Type of Involvement:*	
9. **National Project Focal Point**:	*Mr. Jesse Benjamin* *Director, Department of Energy*		
10. **National Implementing Agency[2] for project:**	*Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Environment, Energy and Natural Disaster Management*		
11. **MDB SREP Focal Point and Project Task Team Leader (TTL)**:	*HQ-SREP Focal Point for ADB: Mr. Jiwan Acharya (jacharya@adb.org)*	*TTL for ADB:* *Mr. Anthony Maxwell (amaxwell@adb.org)*	

Summary of the Project

The proposed Energy Access Project ("Project") refers to the Small Hydropower Project of the Vanuatu SREP Investment Plan (IP). The project is one of two subprojects (i) base load 'run of river' hydro generation on Malekula and Espiritu Santo ($7 million supported by the ADB), and (ii) individual solar systems and micro/ mini-grids for rural electrification ($7 million supported by the World Bank). Both projects were endorsed by the SREP Sub-committee as part of the Vanuatu IP in November 2014 with a total SREP allocation of $14 million.

The Government of Vanuatu has requested that proposed SREP financing of $14 million allocated towards the implementation of SREP IP be provided as 100% grant. The economy has been severely impacted by Cyclone Pam in March 2015, whose damage has been estimated at 60% of national GDP. The IMF reclassified the country's debt distress level from low to moderate considering the large cost entailed in the reconstruction efforts. In November 2011, the SREP Subcommittee proposed that funding can be provided as 100% grant for countries with moderate risk of debt distress[3].

[1] The Asian Development Bank (ADB) provided project preparatory technical assistance, including (i) ADB. 2012. *Technical Assistance to Vanuatu for Preparation of the Energy Access Project.* Manila, and (ii) ADB. 2009. *Technical Assistance for the Promotion of Renewable Energy in the Pacific.* Manila. The latter assisted with screening the provincial centers for priority renewable energy projects.

[2] Can be Government agency or private sector firm

[3] SREP Subcommittee indicated debt risk could be determined at the time of the endorsement of the proposed investment plan, however it is considered that a change in debt risk as a result of a natural disaster between investment plan and project approval was not envisioned in that decision. As a result, the Government of Vanuatu is requesting 100% grant as they are in high debt distress at the time of accessing the funding. In the event that the

The Project is integrated into the Government's long term strategic planning supporting the Government's Priority and Action Agenda (PAA) 2006-2015, which aims to: (i) reduce the cost of services; (ii) extend the coverage of rural electrification; and (iii) promote the use of renewable energy. The Project is aligned with the Government's action document "Planning Long, Acting Short, 2009-2012" which aims to: (i) ensure that electricity is more widely available at a fair price; and (ii) encourage investment in renewable electricity. It is included in the Vanuatu National Energy Road Map (NERM) 2014.The project is also included in ADB's country partnership strategy, 2010–2014 and the country operations business plan, 2014-2016.

The proposed Energy Access Project will assist the Government of Vanuatu in expanding the country's renewable energy generation and increase energy access by constructing the Brenwe Hydropower Plant in Malekula and extending distribution grid in both Malekula and Espiritu Santo. The Project will have four outputs:

(i) Brenwe Hydropower Plant. A 400 kilowatt (KW) run-of-river hydropower plant will be constructed, including (a) a total of two kilometer (km) access roads, (b) a 21 km transmission line (20 kilovolts), (c) an intake structure, (d) a 1.0 km headrace canal, (e) a 190-meter steel penstock, and (f) a powerhouse.
(ii) Distribution grid extension. The project will finance 79 km distribution lines, step-down transformers, and poles.
(iii) Capacity building. Newly connected households will be trained on options for electricity-based income generation, electricity safety, and household budget management.
(iv) Efficient project management services. A project management unit (PMU) will be established that will provide efficient technical design, management, and supervision services.

Access to Energy and Potential Energy Resources

Vanuatu is a small island developing state located in the South Pacific Region. The country has a total population of 234,000 (2009) or about 50,000 households that is geographically dispersed over more than 80 islands. The population is largely rural (75.6%) while roughly 25% are residing in the main island of Efate. Majority of households do not have access to a reliable source of power. The national electricity access rate is 33% and a wide variation of electricity distribution exists between urban (82%) and rural areas (17%). Of the households who have access, 64% are connected to the grid, while the remainder relies on solar systems or diesel generators. For the majority who do not have access to electricity, they rely mainly on kerosene, candles and gas lanterns for lighting.

The primary reasons for the low access rates in the country are due to (i) low capacity to pay; electricity prices are high for most consumers; (ii) lack of government community service obligation funding for grid extensions; (iii) difficult geography and small, dispersed pockets of population; and (iv) the high cost of diesel power generation in the provincial centers due to difficult supply chains and small size of grids, which provides a disincentive to increase customers (where generation and supply costs exceed the tariff) particularly given the low lifeline tariff.

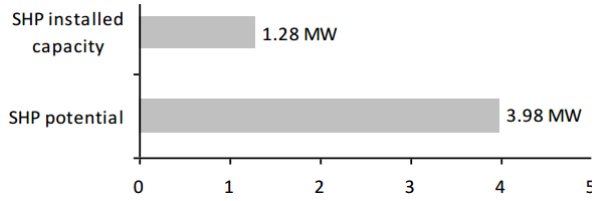
Only four of the islands have grid systems (i.e., Efate-Port Vila, Malekula, Tanna and Espiritu Santo-Luganville) which are operated by private concessionaires, the UNELCO and the Vanuatu Utilities and Infrastructure Limited (VUI). UNELCO and VUI operations are financed through

SREP Subcommittee decides that part of the SREP funding is to be in the form of debt, then the Government of Vanuatu requests that the share of grant to debt for the ADB and the World Bank supported projects be the same.

electricity tariff and do not receive direct government subsidies. The Espiritu Santo grid is the second largest grid in Vanuatu with a peak demand of 1.7 Megawatt (MW) and installed capacity of 4.09 MW[4] comprised of diesel, hydropower, and solar generation. While, the Malekula grid is the third largest grid with 429 kW installed diesel generation and peak demand of 140kW. The country's grid systems have a total installed generating capacity of 31.5 MW composed of approximately 27.1 MW of diesel generation (86%), 3.1 MW wind generation (9.8%), 1.2 MW in hydroelectric power (3.8%), 0.04 MW coconut oil generation, and <100 kW of grid connected solar generation (<1%).

Vanuatu has considerable renewable energy (RE) potential, and significant past experiences on developing RE projects. The country has good solar resources with estimates of average global horizontal irradiation (GHI) in various locations ranging from approximately 1,900 to 2,300 kWh/m2/year. On biofuels, coconut oil has the most potential and can be used in existing and new diesel generating sets; however, the highly variable global price and issues on sustainability of the resource makes it a relatively high cost form of RE. On geothermal, Vanuatu has no installed capacity yet though there are potential sites (i.e. three sites in Efate and Takara site in North East Efate) identified as best candidates for geothermal power plants. On wind, resource data shows a few good locations for wind energy and identified several sites with good capacity factors. Among these RE resources, hydropower has been identified as the proven and most viable RE technology for Vanuatu. One small hydropower plant is currently connected into a grid concession area the Sarakata Plant in Santo Espiritu with 1.2 MW hydropower capacity.

Figure 1: Small hydropower capacities in Vanuatu[5]



The Government remains strongly committed to developing RE. This includes commitment to RE projects funded by concessionaires, independent power producers (IPPs) and donors, development of sustainable models for rural electrification, and regulatory arrangements to develop an energy sector that encourages and facilitates RE investment.

Consistency with Key SREP Investment Criteria

Increased RE capacity and increased access to energy via RE: The proposed project will increase renewable energy generation through the installation of hydropower plant in Malekula and increase clean energy access in the two islands of Espiritu Santo and Malekula by extending the distribution grid. These two islands have the second and third largest population centers after Efate. The project will directly finance the installation of Brenwe Hydropower Plant with a total capacity of 400 kW. Using a conservative plant load factor of 80%, it is expected to generate a total of 2.8 Gigawatt-hour (GWh) annually. The Brenwe hydropower plant will provide in excess of 90% of the total generated energy for the Malekula grid through to 2040.[6]

[4] The 4.09 MW is comprised of (i) 1.2 MW Sarakata Hydropower Plant; (ii) 2.85 MW diesel generators, and (iii) 40 kW grid-connected solar.
[5] Source: Liu, H., Masera, D. and Esser, L., eds. (2013). *World Small Hydropower Development Report 2013*. United Nations Industrial Development Organization; International Center on Small Hydro Power. Available from www.smallhydroworld.org.
[6] Backup diesel generation will be maintained (in case of disruptions to the hydropower supply or during periods of

The project will promote the advantages of scaling up RE systems in Vanuatu and address the country's energy challenges. SREP grant will help address key barriers in small hydropower development in the country such as high capital costs, lack of in-country capacity, lack of capacity building on project management, and lack of commitment among project recipients.

Main beneficiaries of the Project are households and businesses in the provincial centers of Vanuatu. With the grid extension, there is an opportunity to significantly increase the grid access rate from 8% to 14% in Malekula and from 22% to 29% in Espiritu Santo. The project is expected to benefit around 1,050 households in these two islands, including subsidized connections to 100 female headed and poor households.

Low-emissions development: Vanuatu is highly dependent on the use of diesel for its electricity generation comprising more than 80% of the total generation. The installation of hydropower plant will diversify the country's energy generation mix, reduce dependence on expensive fossil fuels, and contribute to economic growth. Increasing RE in the national energy mix will benefit the economy by (i) improving balance of trade by reducing fossil fuel imports (ii) placing downward pressure on tariffs, (iii) minimizing tariff volatility by partially converting the national grid to renewable energy, (iv) supporting growth of the private sector, and (v) reducing household expenditure on electricity.

The implementation of the project will displace an estimated 90% of the diesel generation in Malekula. This will reduce greenhouse gas (GHG) emissions by about 2,900 tons of carbon dioxide equivalent (tCO2e) yearly or about 72,500 tCO2e over 25 years project lifetime. Substantial co-benefits will also be realized from avoided use of traditional biomass for cooking and lighting.

Affordability and competitiveness of RE: Vanuatu's dependence on imported fuel creates supply risks (potential for fuel supply interruptions) as well as affordability problems for customers. World diesel markets have exhibited substantial price volatility in recent years, as well an increasing upward trend (while global crude oil prices have dropped in the last several months, prices are still well above the price range that persisted from the late 1970s through 2005). The country's cost of petroleum product imports typically exceeds 17% of total imports and 85% of the total value of exports. Shipping diesel to Tanna and Malekula, which do not have deepwater ports, adds a substantial margin to the already high cost. The fuel cost increase is passed through via an indexation formula applied to tariffs. As evident in the past four years, the base electricity tariff in UNELCO's concession areas has increased by almost 9%.

The proposed project will provide cheaper and more reliable power supply to meet power demand in Espiritu Santo and Malekula. The proposed hydropower plant and extended distribution grid have been assessed to be technically viable. Analysis has been completed to determine the optimum technical configuration for all components, including analysis of the hydrology of alternative river catchments, hydropower turbine size configurations, penstock arrangements, and distribution configurations to maximize system efficiencies. The design was based on analysis of Vanuatu's conditions to ensure that the proposed systems are suitable for local conditions. Hydrological monitoring is ongoing at the proposed site and will be used to update the analysis during detailed design. As the least-cost base load generation option for Malekula, the hydropower generation plant and extension of grids will facilitate reduction of household expenditure on energy services by 20% for newly connected households.

low river flow), and will also operate periodically for maintenance purposes and unplanned outages.

Productive use of energy: The sustainable, affordable, and quality power supply will promote productive energy use in Malekula and Espiritu Santo. It will support increased energy access for households and businesses in the provincial centers of Vanuatu, contributing to inclusive economic growth particularly in the agriculture and tourism sectors. Potential project beneficiaries indicated that they intend to use electricity primarily for lighting and operating small businesses.

Economic, social, and environmental development impact: Provision of modern electricity services to communities through distribution extensions has been demonstrated to support economic growth, particularly where supporting existing infrastructure is in place, such as access roads to markets, communication systems, and agricultural produce suitable for value adding.

Economic benefits will mainly accrue from the reduced electricity prices resulting from less expensive power generation, and increased livelihood and employment opportunities. The cheaper and more reliable power supply is expected to stimulate economic development and support local industry, for example in agriculture and tourism). The 2-km access road that will be constructed as part of the hydropower plant will benefit local communities particularly farmers as it will also serve as transit road for them in transporting their produce.

For social and environmental aspects, benefits will come from reduced noise and pollution from generating sets, improved educational and health facilities, and reduced indoor health and safety issues associated with burning kerosene. Women and children will largely benefit from the project as they are typically responsible for household activities such as cooking, gathering of fuelwood and other traditional biomass, improve children's education, etc.

Economic and financial viability: The economic internal rate of return (EIRR) for the consolidated project is 18.6%. This compares favorably with the economic opportunity cost of capital of 12% recommended in ADB's Guidelines for the Economic Analysis of Projects. A sensitivity analysis was conducted to account for potential increases in economic costs, as well as a reduction of economic benefits. The EIRR is robust to 20% increase in cost and 20% reduction in benefits, as well as combined 20% increase in cost and 20% reduction in benefits.

The financial internal rate of return (FIRR) of the Brenwe hydropower plant, not including distribution components, is 8.9%, with a project net present value of $4.1 million. The financial viability of the hydropower project has been assessed comparing the FIRR with the (real) weighted average cost of capital (WACC). The WACC to the government is 7.6%, which is lower than the FIRR. The FIRR of the distribution components are negative. A sensitivity analysis was conducted to account for potential increases in financial costs, as well as a reduction of financial benefits. The Brenwe Hydropower Plant FIRR exceeds WACC for 20% increase in costs and 20% decrease in revenues, however FIRR is below WACC for combined 20% increase in costs and 20% decrease in revenues. The Brenwe hydropower plant has been assessed as the least-cost generation alternative for the Malekula grid.

Leveraging of other financing: The SREP funding will leverage $5 million ADB funding ($2.5 million loan, $2.5 million grant), and $3.1 million Government financing, consisting of land acquisition costs, taxes and duties, and distribution civil works contracts.

Co-benefits: This proposed project will have significant potential development co-benefits. These include:

- *Employment:* creation of temporary jobs during construction and permanent jobs during operation and maintenance;

- *Social:* improvement in the provision of local social services such as community health centers and schools;
- *Environment:* reduction of conventional pollutant emissions (including black carbon) as well as GHG emissions from the avoided use of fossil fuels;
- *Local capacity development:* the capacity building component will increase knowledge and experience in hydropower development; it will promote improvement in the operational capacity of Project Management Unit staff through training on gender awareness, project monitoring, financial management, etc.
- *Community co-benefits:* the project will involve households and communities in watershed protection and management program. Women and other vulnerable groups will likewise be encouraged to engage in livelihood and more productive income generating activities e.g. agribusiness value-adding, handicraft production

12. **Stakeholder engagement**

The proposed project recognizes the importance of community participation in achieving sustainability and success in project implementation. In Vanuatu access to communally owned land needs to have the consent of all community members. The need to involve communities and various stakeholders especially the landowners and resource users is to ensure conflicts and issues arising from land access, acquisition and land use will be avoided.

As part of stakeholder participation strategy, the project's Communication, Consultation and Participation Plan (CCPP) will provide a framework for the participatory process and activities. The activities will be part of the capacity building program component and will be implemented within a period of four years.

The objectives of the communication, consultation and participation strategies are to:

i. Help optimize the beneficial impact and effectiveness of the hydropower project;
ii. Create a sense of responsibility and ownership of the project;
iii. Develop potential for long term sustainability;
iv. Address and support other developmental needs such as improvement of access to social services, increased income generating activities and poverty reduction; and
v. Minimize conflict due to negative impacts of project activities through agreement on mitigating measures.

Moreover, the CCPP will facilitate and help improve beneficiary driven approach for sustainable social development interventions particularly for the women and other vulnerable groups, as well as the landowner and resource users.

13. **Gender considerations**

The Project is classified by ADB as effective gender mainstreaming. A gender action plan (GAP) has been developed based on gender analysis and community consultations, and includes specific measures related to ensure project benefits for women during design and implementation phases. Measures include:

i. women's engagement in consultation activities (i.e., at least 40% female participation);
ii. extension of power connection to 1,050 households, including at least 100 female-headed households;
iii. capacity building training for newly connected households including women on power safety, utility budget management, and potential use for income generation;

iv. encouragement of women's participation in project-related contracts; and
v. collection of sex-disaggregated project-related data for monitoring and reporting requirements.

The Project's GAP will be implemented by the PMU, supported by an international resettlement/gender specialist who will lead and manage the GAP implementation. The specialist will establish a monitoring system to track employment opportunities and technical training for local people, the poor, and vulnerable groups.

14. **Key Results and Indicators for Success (consistent with SREP results framework):**
The performance indicators outlined below are derived from the SREP Results Measurement Framework. These indicators will be tracked at least annually. Suggested performance indicators for the project include:

Result	**Indicator**
Installed capacity from renewable energy, as a result of SREP interventions	400 kW hydropower generation
Annual electricity output from renewable energy, as a result of SREP interventions	2.8 GWh energy produced annually
Number of women and men, businesses and community services benefitting from improved access to electricity and fuels, as a result of SREP interventions	1,050 households with increased access to electricity ➢ 100 female headed households with subsidized connections
GHG emissions avoided - Annual - Lifetime	 2,900 tCO2e 72,500 tCO2e over 25 years project lifetime
Development indicators - Job opportunities during construction works and extension of the distribution grid	

15. **Budget:**

Expenditures[7]	**Amount (US$) –** estimates	
a. Investment Components	**5,500,000**	
Civil works	1,200,000	
Equipment	2,400,000	
Project management	1,900,000	
b. Contingencies (physical and price)	**1,500,000**	
SREP Total Cost	**7,000,000**	
Co-Financing[8]:	*Amount:*	*Type of contribution:*
• MDB: ADB	2,500,000	Special Fund Resources (loan)
• MDB: ADB	2,500,000	Special Fund Resources (grant)
• Government[9]	3,100,000	Government
Co-Financing Total	**8,100,000**	

[7] These expenditure categories may be adjusted during project implementation according to emerging needs. The amounts listed are for SREP funds only; a detailed breakdown of the financing plan is presented in the draft Report and Recommendation of the President.
[8] Cofinancing includes: in-kind contributions (monetary value), MDB loan or grant, parallel financing, etc. Possible private sector co-financing, in addition to community contributions, is not quantified herein, but is expected in the future, e.g., via supplier credit and new business models for delivering micro-energy systems.
[9] Government financing includes land acquisition costs, taxes and duties, and distribution civil works contracts (financed through concession holders)

16. **Program Timeframe**

For ADB
Expected Board/MDB Management[10] approval date: December 2015
Expected Program closure[11] date: 30 June 2022 (loan/grant closing)

17. **Role of other Partners involved in program**[12]:

- **Ministry of Finance and Economic Management (MFEM)** will be the executing agency for the project. It will oversee implementation and responsible for overall management of the project, and support institutional strengthening and capacity building programs under the project.
- **Ministry of Climate Change Adaptation - Department of Energy (MOCC-DOE)** will be the implementing agencies. It will oversee implementation of the project by the VPMU, and responsible for overall interagency coordination.
- **Vanuatu Project Management Unit (VPMU)** will be responsible for procurement of all civil works and goods contracts. It will implement the infrastructure components of the project, coordinate steering committee meetings, establish a Project Management Unit which will be responsible for day to day implementation of the projects
- **Asian Development Bank (ADB)** will provide overall coordination and advisory support. It will assist in the procurement design and supervision of consultants, review draft tender documents in accordance with Procurement Plan, and conduct regular loan review missions.

[10] In some cases activities will not require MDB Board approval.
[11] Financial closure date.
[12] Other local, national and international partners to be involved in implementation of the program.

Implementation Arrangements

Aspects	Arrangements		
Implementation period	December 2015-January 2022		
Estimated completion date	31 January 2022, with loan/grant closing date 30 June 2022		
Management			
(i) Oversight body	VPMU Steering Committee		
(ii) Executing agency	MFEM		
(iii) Key implementing agencies	MOCC-DOE		
(iv) Implementation unit	59 person-months international and 46 person-months national; additional consultants will be mobilized as required.		
Procurement	International competitive bidding	4 contracts	$7.6 million
	Shopping	1 contracts	$0.1 million
	Direct Contracting[13]	1 contract	$0.1 million
Consulting services	QCBS	107 person-months	$1.5 million
	ICS	12 person-months	$0.4 million
	CQS	Auditor	$0.05 million
Advance contracting	Advance contracting for Design and Supervision Consultants (DSC)		
Disbursement	The loan and grant proceeds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2015, as amended from time to time) and detailed arrangements agreed upon between the government and ADB.		

ADB = Asian Development Bank, DOE = Department of Energy, ICB = international competitive bidding, ICS = Individual Consultant Selection, MFEM = Ministry of Finance and Economic Management, MOCC = Ministry of Mines, Energy and Rural Electrification Ministry of Climate Change, Adaptation, Meteorology & Geohazards, Energy, Environment and Natural Disaster Management, QCBS = quality- and cost-based selection, VPMU = Vanuatu Project Management Unit.
Source: Asian Development Bank

[13] Direct Contracting with Schneider of substation equipment to maintain compatibility with existing equipment.

Problem Tree for Energy Sector