

**GEF**

**35984**

**AGENCY'S PROJECT ID:** P088940

**GEFSEC PROJECT ID:**

**COUNTRY:** Papua New Guinea

**PROJECT TITLE:** Teacher's Solar Lighting Project

**GEF AGENCY:** World Bank

**OTHER EXECUTING AGENCY(IES):** PNG Sustainable Development Program, Ltd.

**DURATION:** 5 years

**GEF FOCAL AREA:** Climate Change

**GEF OPERATIONAL PROGRAM:** OP #6

**GEF STRATEGIC PRIORITY:** CC-2: Increased Access to Local Sources of Financing; CC-4: Productive Uses of Renewable Energy

**ESTIMATED STARTING DATE:** March 2005

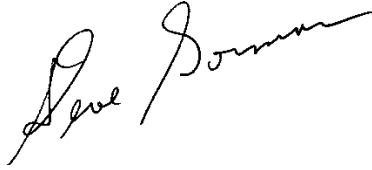
## MEDIUM-SIZED PROJECT PROPOSAL REQUEST FOR GEF FUNDING

<b>FINANCING PLAN (US\$)</b>	
<b>GEF PROJECT/COMPONENT</b>	
Project	\$992,000
<b><i>Sub-Total GEF</i></b>	\$992,000
<b>CO-FINANCING</b>	
IBRD/IDA/IFC	\$5,000
Government	\$78,000
PNG Sustainable Development Program	\$100,000
Private Retailers	\$117,600
Teachers	\$1,650,000
<b><i>Sub-Total Co-financing:</i></b>	\$1,950,600
<b><i>Total Project Financing:</i></b>	\$2,942,600
<b>FINANCING FOR ASSOCIATED ACTIVITY</b>	
Australian CTF	\$115,000
ASTAE	\$55,000

**CONTRIBUTION TO KEY INDICATORS OF THE BUSINESS PLAN:** The Project directly contributes to the GEF business plan indicators for accessing local sources of financing and productive uses of energy by mobilizing consumer financing of at least \$1.65 million during the project period and an estimated US\$8 million in the following 5 years in solar lighting kits (CC-2) and by doubling the number of households in rural PNG using renewable energy instead fossil energy for lighting during the project period and increasing this five times in subsequent years.

<b>RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT:</b>		
Official & Endorsing Agency	Endorsement Date	Nature of Endorsement
Valentine Kambori, Secretary, Department of National Planning and Rural Development	Oct. 14, 2004	Lead Multi-Lateral Development Coordinator
Dr. Wari Iamo, Secretary, Department. of Environment & Conservation	May 28, 2004	GEF National Focal Point
Peter Baki, Secretary, Department. of Education	Oct. 15, 2004	Client Agency
Camillus Midire, General Manager & CEO, PNG Sustainable Development Program Ltd	Dec. 30, 2004	Executing Entity
Michael Koisen, CEO, PNG Teachers Savings & Loan Society	Aug. 4, 2004	Financial Intermediary

This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for a Medium-sized Project.

A handwritten signature in black ink, appearing to read "Steve Gorman". The signature is written in a cursive, flowing style.

Steve Gorman  
GEF Executive Coordinator, World Bank  
Date: April 29, 2005

Project Contact Person:  
Robin Broadfield, GEF Regional Coordinator  
Tel. and email: 202 473 4355  
rbroadfield@worldbank.org

## TABLE OF CONTENTS

<b>A. SUMMARY .....</b>	<b>1</b>
<b>B. COUNTRY OWNERSHIP.....</b>	<b>2</b>
1. <i>Country Eligibility.....</i>	<i>2</i>
2. <i>Country Drivenness.....</i>	<i>2</i>
<b>C. PROGRAM AND POLICY CONFORMITY.....</b>	<b>3</b>
1. <i>Program Designation and Conformity.....</i>	<i>3</i>
2. <i>Sector issues.....</i>	<i>3</i>
3. <i>Assessment of target market.....</i>	<i>5</i>
4. <i>Project Design.....</i>	<i>6</i>
5. <i>Project Activities.....</i>	<i>8</i>
6. <i>Benefits and Beneficiaries of the Project.....</i>	<i>11</i>
7. <i>Risk Assessment.....</i>	<i>13</i>
8. <i>Sustainability (including financial sustainability).....</i>	<i>14</i>
9. <i>Replicability.....</i>	<i>14</i>
10. <i>Stakeholder Involvement.....</i>	<i>16</i>
11. <i>Monitoring and Evaluation.....</i>	<i>16</i>
<b>D. FINANCING.....</b>	<b>17</b>
1. <i>Co-financing.....</i>	<i>18</i>
2. <i>Cost-Estimate by Component and Source of Financing.....</i>	<i>18</i>
<b>E. INSTITUTIONAL COORDINATION AND SUPPORT.....</b>	<b>20</b>
1. <i>Core Commitments and Linkages.....</i>	<i>20</i>
2. <i>Consultation, Coordination and Collaboration between and among Implementing Agencies, Executing Agencies, and the GEF Secretariat, if appropriate.....</i>	<i>20</i>
3) <i>Public involvement plan.....</i>	<i>20</i>

## **PART II: ANNEXES**

ANNEX 1	23
ANNEX 2	24
ANNEX 3	30
ANNEX 4	32
ANNEX 5	33
ANNEX 7	43



## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
CBO	Community Based Organizations
ESMAP	Energy Sector Management Assistance Program
GHG	Green House Gas
GOPNG	Government of Papua New Guinea
IDA	International Development Association
JICA	Japan International Cooperation Agency
MDG	Millenium Development Goals
MSP	Medium Sized Project
NGO	Non-Governmental Organizations
PMU	Project Management Unit
PNG	Papua New Guinea
PNGSDP	Papua New Guinea Sustainable Development Program, Ltd.
PV	Photovoltaics
SHLK	Solar House Lighting Kit
SHS	Solar Home Systems
SLP	Solar Lighting Project
TE	Metric Ton (1000 kg)
TSL	PNG Teachers Savings and Loan Society
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change

## **A. SUMMARY**

The main development objective of this project is to improve the life of rural human services providers by making available affordable, environmentally sound, basic electricity services from renewable energy. This will help improve teacher and health worker retention by reducing isolation (through access to radio and other communications) and providing safer and better living conditions (through access to lower-cost, better quality lighting). The main global environmental objective is to create early markets for solar PV household electrification and build the capacity on the part of all market participants (providers, purchasers, lenders, and regulators) needed to rapidly scale up renewable energy applications in PNG.

Provision of lighting in rural Papua New Guinea (PNG) is mostly through diesel or kerosene lamps. These have become extremely expensive, due both to rising fuel costs and the cost of transporting fuels by plane or by foot. Solar Photovoltaic (PV) electricity in the form of solar house lighting kits (SHLK) can provide a less-costly, higher-quality and more reliable lighting option than kerosene lighting or dry cell battery lighting. However, there are many barriers that must be overcome before SHLK can make commercial inroads in PNG. A small scale pilot, targeting 2,500 teacher's households in 5 provinces, should establish sufficient confidence in the technology and SHLK suppliers on the part of users and lenders to allow scaling up, both to the more than 50,000 other government employees (teachers, health workers, police officers) posted to rural locations and eventually to many of the 800,000 total rural households lacking electricity in the country.

This medium-sized GEF project has been prepared to address specific barriers identified as preventing the use of solar PV for house lighting and other purposes in remote areas. The pilot, to be followed by rapid replication in other provinces, will yield global environmental benefits in the form of lower carbon emissions from reductions in household use of kerosene and diesel fuels. The selection of teachers (and eventually other rural human services providers) as the target group enhances country driven-ness and makes it possible for the project to contribute to the international Millennium Development Goals (MDGs) as well.<sup>1</sup>

Specific project objectives include:

- Improve delivery of education and health services in rural PNG through longer retention of teachers (and eventually health workers) posted to remote rural areas;
- Remove barriers to the wide spread use of solar PV for electricity use in areas not likely to ever be served by centralized or decentralized power grids;

---

<sup>1</sup> Particularly Goal 2: Achieve Universal Primary Education and Goal 7 : Ensure Environmental Sustainability

Project components formulated to meet these objectives include:

- Provide an affordable financing package which will make the purchase of solar lighting kits affordable for teachers, health workers, and eventually the general public;
- Build capacity within the PNG renewable energy industry, by requiring retailers to obtain PV-Gap certification (which include ISO 9000) and by regularly producing a catalogue with certified solar PV components; and
- Build consumer awareness and confidence in the use of solar lighting, by requiring extensive outreach and support to SHLK purchasers;

## **B. COUNTRY OWNERSHIP**

### *1. Country Eligibility*

Papua New Guinea ratified UNFCCC on March 15, 1993

### *2. Country Drivenness*

The project concept originated with the Department of Education's Teacher Education and Staff Development Division.<sup>2</sup> The project directly responds to an ongoing crisis in teacher retention faced by the national Departments of Education and the various Provincial Divisions of Education. There are presently some 36,000 elementary, primary and secondary teachers posted throughout the country. Over ninety percent of teachers are located in rural locations and serve the predominantly rural PNG population. Most elementary and primary school teachers have little or no provision for power supply. Primary schools in particular typically do not have electricity or communications abilities, and teachers posted to these schools and their families suffer from this lack of basic amenities. Poor teacher retention directly contributes to low levels of access to education and poor educational outcomes.<sup>3</sup>

At the national level, the Department of Education (DoE) has actively sought solutions to the lack of access to electricity by rural primary schools. In 1996 -1998 the DoE, with support from the Government of Japan, undertook a program to provide renewable power supply for 320 schools in 20 provinces throughout the country.<sup>4</sup> The Department has a proven track record in mobilizing grant assistance and undertaking projects to pilot renewable power supplies for rural education energy needs, such as FM radios.

---

<sup>2</sup> Letter from Secretary Baki to Mahesh Sharma, World Bank Country Manager dated October 31, 2002. Subject: Support for Rural Electrification in Remote Schools.

<sup>3</sup> Papua New Guinea Interim Strategy Note, September 2004. Papua New Guinea, Pacific Islands and Timor-Leste Country Unit, East Asia and Pacific Region, The World Bank.

<sup>4</sup> The Solar Lighting Kits for Rural Primary Schools Program was an initiative of the National Department of Education sponsored by the government and people of Japan through the Structural Adjustment Program Non Project Grant Assistance. See *Solar Lighting Kits for Rural Primary Schools: Project Report*, Department of Education, Papua New Guinea.

This project enjoys the support and endorsement of all GOPNG agencies engaged in rural development and rural education. It has been endorsed by the Department of National Planning and Rural Development, the Department of Education, and the Department of Environment and Conservation (See Annex 7), and is supported by the Department of Health, Department of Provincial Affairs, Department of Treasury, the Department of Petroleum and Energy, and of course the local governments of the five provinces targeted by the pilot project. Discussions have been held and expressions of support received from other donors as well, including UNDP, ADB, AusAID, and JICA,. The project is fully consistent with the recently-promulgated Interim Strategy Note and the GOPNG's Medium Term Development Strategy, both of which stress the importance of maintaining the quantity and quality of primary school teachers at rural district and sub-district levels.<sup>5</sup>

## **C. PROGRAM AND POLICY CONFORMITY**

### *1. Program Designation and Conformity*

The project is responsive to the GEF's OP # 6, as it directly contributes to wider use of renewable energy technologies in rural power supply, especially for off-grid household electrification. Additionally, the strategies and outcomes that GEF financing will support are closely aligned with two Strategic Priorities for the Climate Change Focal Area, as follows:

- Financial remediation supporting self-financing of household-level electrification kits will contribute to Strategic Priority CC-2 (Increased access to local sources of financing). This project will directly leverage over \$1.5 million in consumer financing over the course of the pilot project and \$1 million per year thereafter via a revolving fund;
- Enabling SHLK as an affordable alternative to kerosene lighting will contribute to Strategic Priority CC-4 (Productive uses of renewable energy). The project will create an early market for 2,500 household solar kits installed during the course of the project, and create the conditions, including industry capacity and a revolving fund, allowing rapid scale-up to a goal of 2,000 households annually as the SHLK market grows.

### *2. Sector issues*

For most rural Papua New Guineans the only benefit received from government is access to a few critical services – notably children's inoculations and maternity care received at remote health clinics and aid posts and elementary and primary school education received at remote schools. The venue for delivery of these health and human services to the rural population consists of 300 local government seats, 650 hospitals, health clinics and aid posts, and 3,500 primary schools and 12,000 elementary schools throughout the country, many of them two-three days walking distance from the nearest transport point.

---

<sup>5</sup> Medium Term Development Strategy 2003-2007, Final Draft Report, Dept. of National Planning and Rural Development, December 2003.

Less than 10% of PNG’s rural population has access to electricity – the lowest access level in the region. The energy needs of some larger government-owned human services centers in provincial and district towns are supplied by distributed generation systems; however, most of the thousands of health and education facilities across the country have no provision for power supply at all. Primary schools typically do not have electricity or communications abilities, and teachers posted to these schools and their families suffer from a lack of basic amenities. Isolation, lack of amenities and safety concerns are some of the reasons why teacher retention at remote primary schools is one of the biggest problems faced by the Department of Education.

Renewable energy has made some small inroads in PNG. At least two GOPNG agencies - the Health Department and Education Department - have recognized the potential of solar PV for supplying certain critical loads, notably HF radios, vaccine refrigerators and lighting. In this regard, the Secretary of the Department of Education submitted a proposal to the Bank in October 2002 seeking grant co-funding to provide solar PV-based electricity services for rural teachers. That initial proposal resulted in this proposed Teacher’s Solar Lighting Project.

A small but industrious renewable energy business community has developed to service the markets for renewable energy goods and services, especially small hydro and solar PV systems. At present there are five well-known providers of renewable energy goods and services, as summarized in Table 1. The most common renewable energy applications are mini/micro hydro and solar PV systems, both of which are usually sold to institutions rather than to individual households or businesses. The predominance of the institutional market reflects the dependence on donor financing as well as the difficulty of establishing and operating a retail sales and servicing network over rugged terrain in rural PNG.

<b>Renewable Energy Provider</b>	<b>Specialty</b>	<b>Indicative Project/Activity</b>
Rural Power Supplies	Retailing and community project development	Retail outlets in Pt. Moresby, Lae, and New Britain
ESCO	Household-level systems	Outlets in several provincial capitals
DATEC (Enertec)	Purpose-built solar PV power supplies	GOJ-funded Rural Primary Schools solar lighting project (300-400 W systems for lighting & TV at 329 schools in 20 provinces)
Rural Development Services Ltd (RDS)	Institutional & community projects	New Britain Palm Oil Co Ltd Solar Compound (solar PV for lighting of community schools and clinics)
TE (PNG)	Purpose-built solar PV power supplies	National Health Services Radio Network (75 W HF radio power supplies at 3,000 health centers)

Most sourcing of key system components (solar panels and controllers) are from European, Japanese or North American sources (BP Solar, Sharp, Siemens) and system costs are high compared to comparable systems elsewhere in the East Asia and Pacific region. Key problems faced by the PNG renewable energy industry include packaging products that met the unique demands of the PNG market (security, portability, reliability, ease of maintenance), developing a distribution network to tap markets outside of Pt. Moresby, building sufficient confidence in the products to attract consumer interest and bank lending, and offering products that are affordable by non-institutional customers.

A series of meetings were held with representatives of the PNG renewable energy business community during project preparation. These businesses are supportive of the objectives and approach of this project and have indicated readiness to participate in the SHLK product development and certification process described below.

### *3. Assessment of target market*

A market assessment was undertaken to ascertain the level of interest, willingness to pay, and ability to afford a solar house lighting kit (SHLK) suitable for rural household use. The market assessment was undertaken within the larger context of an ESMAP-funded Study entitled “Innovative Approaches for Provision of Rural Electricity Services in PNG”.

The target market assessment relied on a series of focus group discussions with teachers held in village settings throughout PNG. The assessment revealed the following factors which held uniformly throughout the country and thus were relied upon in the design of this project:

- Although villagers and teachers have a basic awareness of solar electricity for lighting, it is rare to find installations on teacher’s houses or elsewhere in the villages;
- Teachers were largely not aware of the relative benefits of solar vs. kerosene for lighting, and initial capital cost was perceived as a major barrier;
- Those that have seen solar school systems (from the predecessor Japanese-financed operation) generally have the impression that there is both technical risk (the technology is complex and new) and likelihood of theft or damage associated with the systems;
- Teachers interviewed had a net salary of between 600 and 800 Kina monthly and average expenditures of about 640 Kina monthly (See Table 1);
- Teachers’ salaries generally do not allow for much disposable income, and credit obtainable through salary deductions or other means helps smooth household cash flows and facilitate occasional large expenditures (school fees, bride price, and medical expenses). All teachers utilized some form of credit to manage cash flow;
- Very few teachers have access to electricity from school generator or town supply. Most household energy expenditure is kerosene for lighting, with firewood used for cooking;
- Kerosene prices vary considerably (between 2 and 5 Kina per liter), depending on remoteness. Monthly expenditures on kerosene can vary from 30 to over 100 Kina, and have been rising;

- Teachers were aware of some solar lighting kits commercially available, but they were considered too expensive;
- Other barriers to purchase, other than cost, included: fear of theft,<sup>6</sup> difficulty in transport,<sup>7</sup> and perceived complexity/frailty of the technology; and
- Most teachers' houses have 2-3 rooms, an outside sitting area, and an outside kitchen. Houses are constructed of semi permanent bush materials and provided by the school/community and are often in a poor state of repair. Each house will have 1 or 2 kerosene hurricane lamps plus a kerosene pressure lantern, which are moved from room to room depending on activity and need. Kerosene hurricane lanterns cannot provide enough room lighting for sustained school work, and pressure lanterns consume too much kerosene for frequent or extended use. Generally speaking, reliance on kerosene lamps for house lighting greatly restricts the ability of the teacher (and their family) to undertake school or other work at night.

Table 1: Example Household Expenditure for Rural Primary School Teachers

<b>Household Item</b>	<b>Expenditure (Kina/month)<sup>8</sup></b>
Market Food	80
Store Food	400
Kerosene	30
Transport	30
Firewood	30
Rent	20
Other (cigarettes, stationery, buai)	20
Total	<u>640</u>

#### 4. *Project Design*

This is a pilot project that will be undertaken in five regions of PNG in order to test the financial remediation approach and SHLK provider and purchaser capacity building arrangements under varying social, community and institutional environments. The Department of Education (DoE) has nominated the participating provinces as Milne Bay in Southern Region, New Ireland in New Guinea Islands Region, East Sepik in Momase Region, Western Highlands in Highlands Region and Western Province. These five provinces have 870 rural primary schools served by about 4,200 teachers. About 2,500 rural primary school teachers are expected to participate in the five-year pilot project, subsequently scaling up to as many as 2,000 government employees (and commercial

<sup>6</sup> This is well-founded, as solar panels are highly desirable items and past experience from private users as well as government and donor programs has been that rooftop panels, without special secure mounts, are frequently stolen.

<sup>7</sup> Teachers in remote schools are highly mobile and are typically reposted every 1-2 years. Transport is expensive and a large, fragile solar panel and heavy battery can be a hindrance. Although experience in China in similar remote settings have shown that this is not a barrier.

<sup>8</sup> Exchange rate as of June 2004: 3 Kina per USD.

customers) annually. The project will leave behind a revolving fund which will continue to provide interim funding until long-term commercial financing becomes more available.

The project is designed to overcome key barriers to the uptake of renewable energy for off-grid household electrification in PNG, notably affordability, rural household awareness and confidence in the product, SHLK provider capacity and SHLK product supply chain, and sustainability. The project will provide the financial remediation necessary for the PNG Teachers Savings and Loan Society to offer long-term (five year) fixed-rate loans that make purchase of a "Solar House Lighting" kit by school teachers affordable.<sup>9</sup> The project will target school teachers and health workers and work with the financial intermediary to facilitate a repayment scheme based on salary deductions for government workers posted in remote villages.<sup>10</sup> No capital subsidy will be provided to purchasers; rather, transaction-based payments will be provided to the financial intermediary sufficient to compensate them for the increased risk of a five-year loan term versus the normal maximum two year term of loan. At the end of the five year project term the revenues from the financial remediation scheme including interest payments but net of any defaults will be placed in a revolving fund to support subsequent scaling up on a country-wide basis.

Capacity and confidence building for providers and purchasers will be a second focal point of the project. SHLK retailers will be required to get PVGAP accreditation which includes ISO 9000 certification, which will be facilitated by subsidizing the technical assistance required for accreditation. The PMU will develop a set of specifications to guide selection of SHLK products for inclusion in a catalogue of accredited products. SHLK retailers will submit products for consideration and only those accredited products will be able to make their purchase using the extended loan scheme. The project will also build product confidence and support sustainability by providing teachers and health workers who purchase the SHLK with a simple competency based training (CBT) course that will certify them in solar lighting kit installation and maintenance, in the form of a 1 – 2 hour computer based interactive video program, which will be available in every retail location. The course can be completed at the retailers site. Retailers will be provided with training materials and facilities that will ensure they are able to impart the hands-on practical instruction in installation and maintenance of each type of system approved for purchase.

Affordability is expected to improve not only with financial remediation but with reduced SHLK unit costs due to growth in the solar market, improvements in equipment and performance, increased competition among solar kit providers, and improved and more efficient delivery, installation, and servicing channels. Growth in market size, reduction in solar lighting kit costs, increased consumer confidence in solar lighting technology, increased capacity on the part of providers including provincial-level supply chains, availability of financing through a commercial financial intermediaries as well as a stand-alone revolving fund for government employees, and the increasing cost of kerosene lighting will all

---

<sup>9</sup> The monthly repayment for a five-year loan financing 100% of the cost of a solar lighting kit priced at 1500 Kina is 33 kina, equal to current expenditures on kerosene that can be displaced with the solar kit.

<sup>10</sup> The Teachers Savings and Loan Society, Ltd, has revised its constitution, with the approval of its regulator the Bank of PNG, to extend membership to all GOPNG and provincial government employees.

contribute to the long-term sustainability and continued growth of this market beyond the 2010 closing date of the pilot project.

## 5. *Project Activities*

In addition to project preparation and project management, the project will be organized into three main components: (i) Risk Equalization Program, (ii) SHLK Product Development and (iii) Capacity Building for SHLK providers, purchasers, and regulators. Each component and its subparts is described below.

### Risk Equalization Program

Most teachers and health workers receive their salary through direct deposit to accounts housed within the Teachers Savings and Loan Society (TSL). TSL also extends credit to its members, and TSL has obtained the approval of the PNG banking regulator, pursuant to the PNG Savings and Loan Act, for numerous categories of approved loans. The maximum term is 1-3 years for personal loans, with 5 years offered only for the special case of loans for housing construction on State land. The required minimum ratio of savings to loan is specified (1:1 or 1:2, depending on loan category), and the maximum loan size is K10,000 for personal loans and K20,000 for housing construction.<sup>11</sup> Loans with a three year term are only offered for school fees, purchase of State land, housing construction on customary land, building materials and investments. Otherwise, loans have a term of two years or less.

A household cash flow analysis conducted as part of target market assessment suggests that an SHLK that replaces kerosene used for lighting will save around 50 Kina per household per month. This monthly outlay is roughly equal to the monthly repayment required for an SHLK purchased with a loan repaid over 60 months, rather than the conventional 24 – 36 months period now available. A financial remediation package that extends the repayment period by 24-436 months will result in these salaried government employees paying about the same on a monthly basis as they are now spending on kerosene for lighting purposes. Under this financial remediation there is no subsidy on the price of the solar home kits and the grant amounts on-lent through the intermediary would be fully recouped with interest, net of any defaults.

The financial package being offered to the financial intermediary essentially takes away the risk for the financial institution after the third year of the loan. This risk equalization package will also facilitate enhanced liquidity for the financial intermediary and create a revolving fund, which can be utilized beyond the project period, making it an attractive financial product for the present or any successor financial intermediary. Due to the differences between disbursing to the Financial Institution and repayment by the client, the fund will actually grow in real terms, even after allowing for a reasonable default rate.<sup>12</sup> The PNG Central Bank, the supervisory authority of the savings and credit unions in PNG was consulted and endorsed the proposed scheme.

---

<sup>11</sup> Despite the inclusion in its Rules of housing construction on State land as an approved purpose with a five year term, TSL has not, in fact, made any such loans.

<sup>12</sup> Project preparation of the financial remediation component was supported by the Asia Alternative Energy Program trust fund.

Teachers who wish to participate in the Teacher’s Solar Lighting project will have to successfully complete a Solar Lighting Kit installation and maintenance training program, to be made available through retailers. They will then be eligible to apply for a loan for the purchase of an approved kit selected from the Solar Home Lighting Catalogue. The normal loan application, approval and repayment processes will apply. If the application is successful, the Society will make the payment for the teachers’ preferred SHLK directly to the retailer who will then release the goods to the teacher. A detailed description of the risk equalization program is attached as Annex 2.

The required financial inputs are 2,500 teachers and health workers buying solar PV systems for approximately US\$1,650,000 equivalent, which would be made possible through \$500,000 in risk equalization funding from the GEF grant. Additional grant financing will provide for a financial management system, to be located in the Teachers Savings and Loan Society, which will monitor the loan portfolio and the utilization of the fund.

#### Solar Home Lighting Kit (SHLK) Specification and Product Portfolio

This key component will enable retailers to promote a selection of ‘accredited products’ that meet technical and market standards and provide good value for money for the targeted customers. Only those products accredited by the scheme will be able to be purchased from the loan scheme. The PMU will undertake to develop a set of specifications to guide selection of SHLK products for inclusion in a catalogue of accredited products. SHLK retailers will submit products for inclusion in the scheme. These products will then be tested and where successful will be accredited for inclusion in the Solar Home Lighting Catalogue promoted by the financial intermediary, the Department of Education, and participating solar retailers. Support will be provided to PNG Sustainable Energy Limited (PNGSEL) to establish technical assessment procedures which will be used in the accreditation of products.

#### Capacity Building (Technical Assistance) to SHLK Market Participants

The capacity building/technical assistance component consists of four sub-components: (i) Market Development and Training, (ii) Participant Monitoring and Evaluation, (iii) Capacity Building of the Solar PV sector and (iv) Establishing and implementing Battery Recycling regulations.

##### a) Market Development and Training of End-Users

A key constraint for teachers and other rural customers is the lack of consumer knowledge about renewable energy technology, including SHLK. The PMU in cooperation with participating retailers, the Department of Education and provincial stakeholders, will develop a series of ‘awareness’ and training programs for delivery at the district level. Marketing and training specialists would be contracted to provide technical support for this activity. These

programs will be incorporated into the district based teacher in-service course program<sup>13</sup>, which is accessible to all teachers. The awareness and training activities will inform the teachers on the options for solar lighting available to them under the project as well as provide hands-on practical training in installation and maintenance of the solar home lighting kits. Participants in this training will have the option to undertake interactive video computer based training (available both at the in-service training course programs as well as at each of the retail outlets). Successful completion of the training is necessary to be eligible for a solar lighting kit loan under the project.

b) Participant Monitoring and Evaluation of Performance/impact of Solar House Lighting Kits

To review the performance of the solar lighting kit in the field, teachers will receive from the PMU a bonus payment equal to one fortnightly payment, directly into their savings account in return for regular (twice-yearly) SHLK owners' reports. The information contained in these reports will be used to monitor the scheme's effectiveness and refine the product catalogue and other project characteristics. The report will include questions with regards to life style changes as well as children's study habit changes and women's use of PV lighting and radio/cassette use. At the end of the second year, an independent evaluator will be contracted to review the project and on the basis of the experience make recommendations for adjustments as well as focus on up-scaling the project through a market driven approach.

c) Capacity Building of the Solar PV Sector

Participating solar retailers will be subject to required capacity building, including the commitment to get PVGAP accreditation, to establish provincial retail and service outlets and to participate in training and monitoring processes. In return for active participation TA support will be provided to assist retailers to get certified to carry the PVGAP quality mark. If required, retailers will also be assisted to develop marketing programs to enhance access to renewable energy retail outlets at the provincial and district level in the target provinces.

d) Developing National Regulations for the Recycling of Batteries.

The PMU will work with the Department of Environment and Conservation (DoEC) to identify strategic areas for inclusion in a capacity building program that focuses on mitigating the environmental impacts of improper disposal of spent SHLK batteries. Mitigation measures include developing Codes of Conduct for retailers, developing regulations to govern retailer and purchaser handling of batteries, and/or a self-funding battery return/refund scheme to promote proper battery disposal. Under separate Bank Executed TA a study will be prepared to assist the Department of Environment with a review of options to effectively deal with the environmental problem arising from battery disposal.

---

<sup>13</sup> The in-service training period is usually a period of up to 5 pupil free days attached to the end of either the 1<sup>st</sup> or 2<sup>nd</sup> school term. At this time, teachers converge to a central convenient location at the district level for a series of in-service training activities.

## 6. *Implementation Arrangements*

The GOPNG has agreed that PNG Sustainable Development Program Ltd. (PNGSDP), a private company with part Government ownership, will be the executing agent for this project<sup>14</sup>. PNGSDP has delegated this task to their energy subsidiary: PNG Sustainable Energy Limited (PNGSEL). PNGSEL will house the Management Unit (PMU) responsible for the management of the project.

The financial intermediary identified for this project is the PNG Teachers Savings and Loan Society, Ltd. The Savings and Loan Society is a co-operative financial organization incorporated and registered under the Savings and Loan Societies Act of Papua New Guinea (See Annex 2). Active membership of the Society stands at approximately 14,000 members, all of whom are teachers. The Society operates a computerized MIS system (FCS supported from Australia through Credit Union Support Services Limited) with savings and loan repayments being facilitated through payroll deductions.

Other organizations will play important parts in project implementation, including the Department of National Planning and Rural Development (DNPRD), Department of Petroleum and Energy (DPE), Department of Education (DoE), Department of Health (DoH), PNG Power, PNG Teachers Savings and Loan Society, Ltd, Department of Environment and Conservation and Department of Provincial Affairs. Government oversight will be provided through an Advisory Group, chaired by the DNPRD and with participation from the key GOPNG agencies including Education, Health, Petroleum and Energy, Environment and Conservation, and Provincial Affairs. More detail on implementation arrangements is provided in Annex 5.

## 7. *Benefits and Beneficiaries of the Project*

The initial direct beneficiaries of this project will be the teachers and health workers, and their families, who have been posted to remote areas with no power supply and few basic amenities.<sup>15</sup> The children attending rural primary schools or the community being treated in rural health clinics will benefit by being exposed to the amenities and value of modern energy services. Table 2 shows the distribution by province of the target customers in the education and health sectors and other beneficiaries.

The renewable energy industry and its current and potential customers in PNG will directly benefit from the considerable additional investment in solar energy due to this project. The principle benefits of such additional solar energy investments will be an overall cost reduction in the price of solar photovoltaic applications in rural areas, as the result of four separate but reinforcing effects: (a) direct cost reduction through scale up of the market and thereby reduction of overhead and transaction costs for companies; (b) specific industry and business capacity-building efforts to be focused on PNG solar retailers, which together with

---

<sup>14</sup> See Annex 7

<sup>15</sup> Teachers are the immediate target population. Health workers and other GOPNG employees are also eligible. The figures for Table 3 are taken from unpublished Education statistics and from Department of Health statistics from 2001. These figures are not current and represent indicative participant base only.

the increased market size should allow companies to get better terms from their suppliers (discounts on volume purchasers, supplier credit); (c) better affordability of solar products and equipment through access to credit made easier by exposure of lending institutions such as the Teachers Savings and Loan to the technology and the creation of a revolving fund that will continue past the closing data of the project; and (d) reduced costs of ownership and operation as better quality products are introduced, services within the industry and to customers is improved, and access to spare parts is improved. The combined result of these increased market opportunities and improved industrial capacity will be more advanced solar packages available for a wider variety of applications at reduced unit costs and improved levels of performance. As a measure of the market and industry benefits, we estimate that the pace of SHLK purchase and installation will scale up from 500 kits per year in 2005-2009 to 2,000 kits per year in subsequent years (2010-2015) as consumer confidence, SHLK retailing capacity and lending institution involvement grows.

**Table 2 : Distribution by Province of Teachers and Health Workers**

<b>Potential Beneficiaries</b>					
<b>Education - Primary schools</b>	<b>Rural Schools</b>	<b>Total Pupils</b>	<b>Male Teachers</b>	<b>Female Teachers</b>	<b>Total Teachers</b>
East Sepik	241	37,516	590	290	880
Milne Bay	148	15,924	345	373	664
Western Highlands	178	53,101	823	415	1,238
New Ireland	103	6,582	245	373	618
Western	200	32,000	500	300	800
	<b>870</b>	<b>145,213</b>			<b>4,200</b>
<b>Health centers, sub centers, aid posts</b>	<b>Rural Health sites</b>	<b>Total Population</b>	<b>Male workers</b>	<b>Female workers</b>	<b>Total Health Workers</b>
East Sepik	233	292,312	na	na	579
Milne Bay	155	197,574	na	na	666
Western Highlands	194	426,573	na	na	969
New Ireland	86	114,982	na	na	403
Western					
	<b>668</b>	<b>1,031,441</b>			<b>2,617</b>

Taking into account the direct pilot project benefits and indirect solar energy industry benefits, it is possible to estimate the global environmental benefit from greenhouse gas mitigation due to this project. The project will reduce consumption of kerosene for rural lighting by establishing and then scaling up SHLK markets and capacity. Market assessment data suggests a target displacement of 10-20 liters of kerosene per household per month due

to SHLK adoption.<sup>16</sup> Given a kerosene carbon dioxide content of 2.5 kg per liter, this pilot program will deliver as much as 1,500 te of CO<sub>2</sub> annually for the twenty year life of the systems. The indirect benefits of SHLK market creation and scaling up are much larger, however. Market volume is expected to grow from 500 kits per year in 2005-2009 to 2,000 kits per year in 2010 and beyond. Counting both direct project benefits and the benefits from scaling-up the SHLK market carbon benefit produces a carbon savings estimate of 250,000 te of CO<sub>2</sub>.

#### 8. Risk Assessment

The major risk for the success of the project is the reluctance of teachers to commit themselves to a long term loan. To mitigate this reluctance, the project will be promoted and marketed as replacing the costs for kerosene, rather than a five year loan program. Other difficulties mentioned are transport of the equipment. This is addressed by offering a range of products, including some at the lower capacity range that are easier to transport.<sup>17</sup> This project will also significantly reduce the transport distance from retailer to purchaser by encouraging retailers to open outlets in provincial capitals. Currently the SHLK are only available in Port Moresby.

**Table 3: Major Sources of Risk and Mitigation Measures**

<b>Risks</b>	<b>Risk Rating</b>	<b>Risk Minimization Measures</b>
Solar House Lighting Kits (SHLK) are not sold due to teachers unfamiliarity/ unwillingness to take out five year loans	M	Marketing and Training efforts will all focus on paying SHLK as a substitute of paying for kerosene. Teachers have the option to buy within a range of products. If they choose the low-end of the scale (Kina 800 or US\$248) is substantially lower than current cost of kerosene and will constitute not more than 2% of their salary as against the current expenditure for lighting which is over 10%
Solar House Lighting Kits (SHLK) are not sold due to difficulty of transporting the SHLK to their remote locations	N	SHLK offered consist of a range of options, some easy transportable others more difficult. Teachers in the most remote locations can start with the smaller and more transportable system and overtime add additional components
Teachers will default on their repayments	M	The Teachers Savings and Loan Association has a charge over their salaries. In addition, 50% of the cost of the equipment has to be available in a savings account. Thus defaults will only occur if the teacher leaves the service.
Repayment will stop due to the battery or panels being stolen	M	Solar House Kits will include security features such as pole-mounting and security clamps. The training program will include training on prevention of theft.
Retailers will not open up branch	S	Retailers will need a turnover of more than 100 SHLK a

<sup>16</sup> Calculating, Monitoring, and Evaluating Greenhouse Gas Benefits from Solar Home Systems in Developing Countries. Steven L. Kaufman, Sunrise Technologies Consulting. Working paper of the Renewable Energy Policy Project's and funded by The Joyce Mertz-Gilmore Foundation

<sup>17</sup> In North West China, where users are very remote and access is as tough as in PNG, simple transportable yet compact systems have been developed. The project will facilitate the import of samples of these systems and facilitate retailers to establish commercial relations with the producers of these systems.

offices in district capitals and/or cities outside of Port Moresby		year, to make a branch office pay for itself. This project does provide this volume of sales. In addition, other projects (EC Lighting 2004, providing solar lighting kits for schools) have indicated that they will insist to work only with retailers which have outlets in the districts
Overall Risk Rating	S	

Risk Rating – H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or low Risk)

The project would also fail if teachers default on their payments. However, loans are secured by members’ savings and by the authorized deductions that are paid over directly to the financial intermediary by the Department of Education. The main risk of loan default is if the teacher ceases to be employed, takes unpaid leave or is not paid for any other reason.

The risk of theft is difficult to address. The Solar PV system will include proper security clamps. The training program will also include training on theft prevention, but theft will remain a risk. Table 3 shows the major risks and proposed mitigation measures.

#### 9. *Sustainability (including financial sustainability)*

The Project responds to the experience of previous donor-funded efforts in PNG that provided rural infrastructure investments without explicit ownership. These previous efforts typically failed because, without explicit ownership, no beneficiary was motivated to maintain the investment. The Project will encourage sustainability in four ways: (i) the kits will be paid for and owned by the teachers, creating self interest in maintaining the units; (ii) as costs come down through volume sales, the need and extent of financial remediation will decline; (iii) the project will introduce and enforce suitable quality standards for products and services and customer training to ensure that technical failures are minimized; (iv) the early demonstration of solar electricity in rural PNG villages will help raise confidence in the technology and stimulate demand for additional applications, including other high-value domestic and productive uses; and (v) the experience will permit financial intermediaries to quantify risk on longer term lending on solar home lighting kits thereby reducing the need for risk compensation.

Additionally, the project will support the establishment of a Code of Conduct for spent battery waste management in PNG and a battery return mechanism. This will not only mitigate environmental impact of batteries disseminated through the Project but will be extended to include all solar and other lead-acid battery types. The mechanisms to be explored will focus on promoting commercial battery recycling and may include battery branding and a deposit return cycle, in addition to public awareness raising and information on the appropriate disposal of spent batteries.

#### 10. *Replicability*

The current project will provide financial intermediation and purchaser capacity building targeted to some 2,500 teachers in five of PNG’s 15 provinces, in addition to strategic capacity building components for solar product developers, solar retailers, and solar regulators. This project has been designed to stimulate rapid growth in supply and demand

for solar PV products in PNG, both through scaling-up to more target markets in the five pilot provinces and through replication of the basic scheme in PNG’s nine other provinces.

The current project will create the conditions necessary for purchase and sustainable utilization of SolarPV products by providing access to financing, consumer outreach and training, availability of certified and high-quality equipment, and creation of a dealer/retailer network sufficient to create consumer confidence. Although the current project targets this combination of enabling conditions to five provinces and 2,500 teachers, it will provide a basis for rapid expansion. There are 50,000 total government employees posted to rural locations, and many tens of thousands more households with sufficient and stable income to qualify for a credit scheme similar to the pilot financial intermediation scheme. The EU has in consultation with consultants who assisted in the design of this project, decided that the design of houses for school teachers, which will be financed under an EU project, need to take the use of SolarPV into account and allow for an integrated SolarPV solution. There are a number of financial institutions, including many provincial-level and occupational Savings and Loan Societies, which during pre-appraisal showed interest in the scheme. The Bank of South Pacific is considering developing an energy portfolio, including financing of SolarPV based on the success of this scheme. The Executive Agency, PNGSDP Ltd. is contributing the management costs for this project (US\$100,000) for the simple reason that they would like to scale up to the other 10 provinces when the project shows to be successful. IFC is currently in negotiations with PNGSDP to become a partner in PNG Sustainable Energy Limited (PNGSEL), which the aim to increase Renewable Energy capacity, both in SolarPV, as well as in geo-thermal and mini hydro. The supervision of the project will be organized in such a manner as to continuously engage with the financial community and SolarPV retailers, to report the number of systems sold, repayment and arrear ratios and other information to facilitate a quick take up, even during the first years of the project.

While it is expected that the SolarPV systems sold by the project will gradually take off, as we are targeting salaried Government workers and in particularly teachers, who have limited resources, it is expected that after the first year of the scheme, other institutions and organizations will rapidly replicate the scheme to different target groups such as farmers, traders and shopkeepers, as well as expand the scheme to the other 10 provinces in PNG. While the projected sales for the project itself is expected to grow from 90 in year 1 to about 1,000 in year 4, additional sales not financed through this scheme are expected to grow must faster.

	Year 1	Year 2	Year 3	Year 4
Number of SolarPV systems sold (incremental)	90	390	990	1995

The lack of requirement for any subsidy to the cost of the solar lighting kit and the strong participation of private sector retailers and financial intermediaries will support further growth in the commercial SolarPV market. With the increasing cost and unreliable supply of kerosene, the incentives for broad commercial uptake to the general population of the basic repayment and service model are high. There are some 800,000 rural households currently

without access to electricity, so the potential for replication within PNG to the general population is very large.

#### *11. Stakeholder Involvement*

The Government of Papua New Guinea has recognized that provision of modern energy services is an essential element in delivering better quality services in rural areas. This is needed to reverse declining trends in key development indicators of education and health. While renewable energy is a logical resource for supplying electricity for basic services in rural areas, very little is used, even though Papua New Guinea has tremendous natural resources in plentiful sunshine, substantial mini-hydro opportunities and large biomass. As a signatory to the UN Framework Convention on Climate Change, the Government is especially interested in utilizing its natural renewable energy resources to both contribute to the development of the rural population and to reduce emissions of global warming gases. The Department of Conservation and Environment and the Department of National Planning and Rural Development have both endorsed this proposal. Similarly the respective provincial governments from the pilot provinces have indicated support for this initiative. Senior primary school inspectors from the trial provinces were consulted at the annual national schools rating conference in 2002 and again in 2003. They expressed continued support for this initiative. Over the past twenty four months, National Department of Education officials have spoken to teachers at the district level in rural New Ireland, rural East Sepik and rural Milne Bay about this initiative. The interest was high. Recent focus group interviews at sites in 9 provinces involving approximately 100 households undertaken as part of an ESMAP funded study further support these observations.

#### *12. Monitoring and Evaluation*

A quarterly project management report cycle will be undertaken with reports provided to the World Bank by the PMU. An annual financial and management audit will be undertaken as part of the normal internal processes of the PMU. Additional project performance monitoring and evaluation processes will be included in these reports and are detailed in Annex 1.

The executive agency will collect information from all participants in the project and report these in their regular bi annual reports. Data collection responsibilities for monitoring and evaluation are as follows:

Financial Intermediary Reporting. The Teachers Savings and Loan Association (TSL) will report on the number of loans made, their terms and conditions, arrears and default rates and any other difficulties they encounter in the project. The data will be disaggregated by district, gender, years of service.

Participating SHLK Retailers. The retailers will report on the certified products they offer and how many of them have been sold cumulative and during the reporting period, they will provide characteristics of their buyers by district, occupation, gender and purpose for which the solar house lighting kits were sold. They also will report on the way the clients have financed the sales. They will not only provide this data for teachers but also for all other

clients. They also will report on the number of clients who completed the interactive computer based video training, the names and addresses of these clients and their scores. They also will provide to the PMU the evaluation forms clients are asked to fill out after they have passed the test and completed the training. The store owner will also report his/her observations about the training program to the PMU, who will take this into consideration when the training programs are updated.

The retailers will also report on their progress in obtaining the PVGAP quality mark.

Battery Sellers and Recycling Groups. The Department of Environment will report on progress made with drafting and testing regulations covering battery recycling. It will also provide a bi-annual report on the number/weight of batteries formally recycled, where possible the report will identify the source disaggregated by district, gender and occupation of the recycler.

SHLK Purchasers. Purchasers as part of their training in understanding the maintenance and monitoring of their equipment will be taught to maintain performance records for the equipment. They will keep track of the sufficiency of the SHLK for powering lights and other end uses such as radio or TV, as well as making observations on the changes in lifestyle or quality of life from electricity access. Teachers will be encouraged to also make observations outside the standard report format which can help to make the system and the project more effective and efficient. The teachers will be asked to compile their observations in a twice-yearly report to be sent to the PMU. An agreement will be signed by the purchaser and TSL, to allow the PMU to make a cash payment into the savings account of the teacher/user equal to one fortnightly payment after receiving each semi-annual report. Payment for these reports is the second largest expenditure in this project; however this customer feedback is crucial to the successful implementation of this project and subsequent scale-up.

PMU. The PMU will compile all inputs from the various project participants and prepare a comprehensive report using this data for submittal to the Project Advisory Committee and the Bank. This report will include any modifications that can make the project more effective and efficient and broaden the projects impact.

Per the normal Bank procedures in medium-sized GEF projects, the PMU will at the end of the second year appoint an independent evaluator to both review the project and make recommendations regarding the management of the risk equalization fund after the pilot project closes.

## **D. FINANCING**

### FINANCING PLAN

Financing will be provided by GEF grant assistance plus co-financing and associated financing from several sources. GEF grant assistance of \$992,000 is requested and will be matched with \$1.9 million in co-financing for a total project value of \$2.9 million.

1. *Co-financing*

<b>CO-FINANCING SOURCES</b>				
Name of Co-financier	Classification	Type	Amount (US\$000s)	Status*
DoEducation; DoEnvironment	Government	In-kind	78	Confirmed Some used for preparation
IFC	Multilateral	In-kind	5	Confirmed
PNG Sustainable Development Program Limited	Private	In-kind	100	Confirmed
Teachers	Private	Cash	1,650	Transaction-based
Solar Retailers	Private	Cash and In-kind	117.6	Transaction-based
Sub-Total Co-financing			1,950.6	
<b>FINANCING FOR ASSOCIATED ACTIVITY</b>				
Australian CTF	Trust Fund	Cash	115	Committed
ASTAE	Trust Fund	Cash	55	Used for preparation

2. *Cost-Estimate by Component and Source of Financing*

The Education Department drafted the first project proposal for this project; the department also provided technical assistance throughout the long preparation time (4 years). The estimated cost for their contribution during preparation is US\$55,000. In addition, the Department will assist in organizing marketing and training activities for prospective buyers during their bi-annual district in-service training programs. On the assumption of 4 such events a year and US\$250 per event for a period of three years, their contribution to the marketing and training is estimated at US\$3,000. The Department of Environment's contribution is for their work on the battery recycling regulations and pilot testing of a battery recycling scheme. This would be for a total of US\$20,000.

The Pacific Enterprise Development Facility of the International Finance Corporation has agreed to supervise, at their cost, the ISO and PV GAP certification program for retailers of solar equipment. The estimated staff time contribution for this project activity is US\$5,000.

The contribution of PNG Sustainable Development Ltd. is for the management cost of the PMU. The commitment is assumed to be US\$100,000 for the 5 year duration of the project. The commitment is made in writing (see Annex 7).

The solar retailers' contribution is based on the provision of demonstration models for marketing and training purposes (US\$10,000), providing demonstration and training during the bi-annual in-service training programs organized by the Department of Education (US\$3,600) and the training of the actual buyers of the solar equipment. Based on the assumption that 2,500 teachers will purchase a solarPV kit, and they will supervise the training of the end-user for 3 hours based on a US\$12 hour rate for the sales staff/trainer, the contribution for the training for end-users is calculated at US\$90,000.- , The retail sales staff/trainer will also attend a training for trainers at their own cost (calculated as US\$2,000), Finally, in order to qualify for ISO accreditation and the PV-GAP seal, it is expected that the retailers will invest in development of standardizing their assembling and sales procedures at a cost of US\$10,000. The total contribution of the retailers to the project therefore comes to US\$117,600.

PROJECT BUDGET (\$000s)

Component	GEF	PNGSDP	GOPNG, Retailers	Teachers	IFC,	Project total
<b>Project Preparation</b>			55			55
<b>Project Management</b>	100	100				200
<b>Risk Equalization/SHLK Purchase</b>	520			1,650		2,170
<b>Provider and Purchaser Capacity Building</b>						
Market Development & Training	179		108.6			287.6
Participant M&E	75					75
Solar Provider Capacity Building	48		12		5	65
Regulator Capacity Building			20			20
Mid term evaluation	30					30
Miscellaneous	40					40
<b>Project total</b>	<b>992</b>	<b>100</b>	<b>195.6</b>	<b>1,650</b>	<b>5</b>	<b>2.942.6</b>

## **E. INSTITUTIONAL COORDINATION AND SUPPORT**

### *1. Core Commitments and Linkages*

Retention of suitably qualified and experienced teachers to serve in remote rural schools is an ongoing concern for the National department of Education and the Provincial Divisions of Education. Within the education reform process, it is very important to have motivated, qualified and experienced teachers in remote communities to support improvements in the quality of teaching and learning, improved access to education (especially for girls), and higher retention rates for all children through the 9 years of basic education.

Many education officials provide anecdotal evidence of an increasing disinterest among teachers to accept postings to remote schools. Teaching in rural schools is no longer seen as making a contribution to nation building. Teachers and their families are reluctant to accept postings because of the disparity between quality of life in remote rural communities and the more accessible sites. The authorities have been looking at non-monetary ways of rewarding teachers who accept two year assignments to the remote rural schools. Assistance with solar lighting kits for their own use is seen as one of the ways to support teachers in remote rural communities.

The continuing rise in the commodity and transport cost of critical supplies such as kerosene and diesel fuel has led to reduced availability of power or lighting in more remote areas, and the Department of Education is under serious pressure to find solutions to the problem of basic amenities, including lighting, for teachers. Similar difficulties are encountered by other public workers, in particularly health workers and the police force.

### *2. Consultation, Coordination and Collaboration between and among Implementing Agencies, Executing Agencies, and the GEF Secretariat, if appropriate.*

This project has been under preparation for over two years and has been the subject of extensive consultation, coordination and collaboration between and among implementing agencies and executing agencies. Consultations have been undertaken with all interested and affected government departments, including Department of National Planning and Rural Development, Department of Education, Department of Health, Department of Environment and Conservation (wherein the GEF national focal point resides), Department of Petroleum and Energy and Department of Provincial Affairs, and the five provinces in which the solar house lighting project will be piloted. Other implementing and executing agencies have also been extensively consulted, including Aus AID, ADB, JICA, and NZ AID. The ongoing advice as well as informal upstream consultation of GEF Sec has also been obtained.

### *3) Public involvement plan*

Information about the project will be regularly published in the newsletter of the Department of Education. After project approval the monthly newsletter will have a special section in every publication, reporting on the progress of the project. It will include the number of units sold and installed, the amount of kerosene use reduced and the amount of greenhouse gas mitigated. It will also carry anecdotes of teachers about their experience using the solar house lighting kits. Radio programs and written and illustrated publications (like comic books) will be circulated, focusing both on the solar house lighting kit as well as on related climate change issues. During the DoE's in service training seminars all teachers will get training in the use of solar energy, and this project, but over time, when the project matures, the sessions will be updated with additional information on ways to tackle climate change and produce energy in a sustainable manner.

An important element of the public involvement plan is the participatory monitoring of the project. Before teachers and health workers are eligible to participate in the scheme they will complete a training program. The program will not only teach them how to operate and maintain their SHLK, but also how to manage and monitor the performance of the unit. Buyers will be asked to maintain a /weekly log and will report this in a six month report to the project executive agency (See C.11 – Measurement and Evaluation). The teachers, in exchange for this service will receive the equivalent of one fortnightly payment in their bank account for each report accepted by the Executive agency. These reports will focus on the shortcomings of the systems, the capacity of the batteries, and the service received from the retail agencies. This participatory monitoring and reporting system will make possible ongoing adjustments to the project which the PMU can identify and recommend to the Project Advisory Committee for consideration.

The Project Advisory Committee will provide overall governance and direction for the project. Its members will consist of the Departments of Health, Education, Petroleum and Energy, and Provincial Affairs. The Committee will be chaired by the Department of National Planning and Rural Development. The Committee will meet at least twice annually to consider the reports of the PMU and entertain any project issues or decisions required.

**PART II – ANNEXES**

## PROJECT LOG FRAME – OBJECTIVES/OUTCOMES, ACTIVITIES AND INDICATORS

<b>GEF Operational Programs: Promote Adoption of Renewable Energy by Removing Barriers &amp; Reducing Implementation Costs (OP 6)</b>			
<b>Strategic Priorities: Increased Access to Local Sources of Financing (CC-2) and Productive Uses of Renewable Energy (CC-4)</b>			
	<b>Goal</b>	<b>Verifiable Indicators</b>	<b>Means of verification</b>
1	Improve the living conditions of rural service providers	Retention rate of rural service providers And bi-annual reports from end-users	Statistics of the Department of Education Bi-Annual end-user monitoring reports
	<b>Objective</b>		
1	Increase electrification of rural teachers' households through uptake of SolarPV	Amount of Energy produced from Renewable Sources increased Number of pilot participants (Goal: 2500)	Reports from retailers and bi-annual end user reports
	<b>Outcome</b>		
1	Retail Market for solar home lighting kits established	Number of kits sold overall;	Reports from retailers
2	Development and maturation of the PNG solar industry	More retailers entering the market, reduced retail prices of SolarPV, longer dealer warranties, more extensive dealer network with provincial offices.	Reports from retailers, Bi-annual report from End-users
3	Increased consumer and financial community confidence in SolarPV products	Additional banks willing to lend and over longer terms, number of kits sold overall, increased advertising expenditures	Bi annual participation reports, survey research, reports from retailers, survey of financial institutions.
4	CO2 emissions mitigated	Participant reports on the use of solar panels	Bi annual participant reports with verification by mid term evaluation
5	kerosene consumption for lighting replaced by solar PV	Participant reports on sources for lighting end-use consumption	Bi annual participant reports with verification by mid term evaluation; Reports on kerosene distribution, sales and imports
6	Livelihoods improved as more hours for work and study available	Participant reports on household work and study patterns	Bi annual participant reports with verification by mid term evaluation
7	Improved teacher retention rates in five pilot provinces	Records on teacher retention in the five pilot provinces	Provincial and district reports from Department of Education
	<b>Outputs</b>		
1	Purchase and installation of 2,500 SolarPV by teachers in five provinces	Number of kits sold to targeted consumers	Records of financial intermediary and retailers
2	Purchaser training program in place	Availability of program and the incidents of local repairs carried out by the teachers	Review of the training program and bi annual participant evaluation reports and reports from retailers.
3	Affordable Financial Package for the Purchase of Solar PV lighting kits	Number of Customers Borrowing for the purchase of solar kits	Reports from Financial Institutions and Bank of PNG
4	Certified Solar PV catalogue	Published catalogues	Annual Report from Executive Agency
5	Retailers of Solar PV Kits ISO certified and allowed to use PVGAP quality seal	PVGAP license to use PVGAP quality mark	Reports of Certifying Institution
6	Battery Recycling Regulations	Published Regulations and Industry Code of Conduct	Publications of Dept. of Environment

## Financing of Solar Lighting for Teachers

### PURPOSE OF THIS REPORT

This report summarizes the scope and strategy for a financial remediation designed to encourage greater uptake of consumer financing terms available to members of the PNG Teachers Savings and Loan Society (TSL). The report analyzes how TSL might provide attractive financing for the acquisition of solar lighting kits by teachers in five selected PNG provinces, identifies the special risk factors implicit in such an offering, and suggests ways in which the SLP could support TSL in providing such financing.

### Legislation, Regulation and Rules of Savings and Loan Societies (“S&Ls”)

Like all S&Ls in PNG, TSL is authorized to operate in terms of the Savings and Loans Societies (Amendment) Act of 1995 (“the Act”). The Act is administered by the Governor of the Central Bank (the Bank of Papua New Guinea) in his capacity as Registrar of S&Ls (“the Registrar”), who issues directives and approvals from time to time and receives periodic financial statement returns from each S&L.

Apart from laying down the Registrar’s powers, the Act contains detailed provisions for the registration, direction, supervision, management and winding-up of S&Ls. It also sets out Standard Rules which should be adopted by each S&L, although departures from the Standard Rules may be made, subject to the Registrar’s approval.

The Act establishes some specific financial limits for S&Ls, notably the maximum interest rates payable on deposits (7% per annum) and chargeable on loans (1% per month), the minimum proportion of net earnings (20%) that is to be transferred to a General Reserve Fund and the maximum dividend to be paid (7% per annum).

Other financial restrictions have been imposed through directives of the Registrar. These include limitations on S&Ls’ investments in property (maximum 5% of total assets), on the ratio between total loans and total savings (maximum 60%) and on lending more to any member than the balance of his savings (without a joint decision of a S&L’s Loans Committee, its Board and its Supervisory Committee).

### TSL RULES

TSL has obtained the approval of the Registrar to a set of Rules that is based largely on the Standard Rules in the Act but has 28 (rather than 11) categories for acceptable loans to its members. The maximum term (1-3 years for personal loans, 5 years for loans for housing construction on State land) and the required minimum ratio of savings to loan (1:1 or 1:2) are

specified for each loan category. Maximum loan size is K10, 000 for personal loans and K20, 000 for housing construction on State land secured with a mortgage.

## **TSL OPERATIONS AND FINANCES**

This section is not a comprehensive appraisal of TSL but is aimed at illustrating some of the important elements of its operations and finances.

### *General*

TSL operates from a Head Office in Port Moresby and three branches at Lae, Mt Hagen and Rabaul. Total staff is 63, of whom 34 work at Head Office.

TSL offers its members a 2% per annum interest rate on savings deposits. A higher rate is available on limited savings schemes for school fees and a Christmas Club. Deposit rates are well within the maximum rate of 7% per annum permitted under the Act. Members are required to save K20 per fortnight.

Loans are available to any member who is not bankrupt, has not borrowed from any other institution, who has been a member for three months and who has a minimum of K200 savings with TSL. Loans must be for one of the 28 approved purposes, be within the approved term and amount limits and require no more than one third of a member's net income for loan service. Interest is charged at the legal maximum of 1% per month on the outstanding loan balance, which is significantly below the open market rate charged on personal loans by commercial banks.

Despite the inclusion in its Rules of housing construction on State land as an approved purpose with a five year term, TSL has not, in fact, made any such loans. Loans with a three year term are only offered for school fees, purchase of State land, housing construction on customary land, building materials and investments. Otherwise, loans have a term of two years or less.

Loans are secured by members' savings and by authorized salary deductions that are paid over directly to TSL by the Department of Education. Except for loans related to State land, mortgages and other collateral are not normally taken by TSL. The main risk of loan default is if the teacher ceases to be employed, takes unpaid leave or is not paid for any other reason.

## **MEMBERSHIP**

TSL's membership was originally restricted to teachers and employees of provincial education authorities and the national Department of Education. TSL has recently expanded its membership criteria to include any national or provincial Government employee.

Data from mid-2003 show that TSL had 10,756 teacher members out of a total teacher population of 30,570, representing 35% coverage nationwide. Although TSL has some coverage in all provinces, it is not even throughout the country. TSL's membership in the

five provinces selected for the SLP (Milne Bay, Western Highlands, East Sepik and New Ireland) was 2,522, equivalent to 39% of the 6,477 teachers in those areas, slightly above the national coverage.

### *Deposit Growth*

Member's savings deposits rose by 9.1% from 2002 to 2003, according to TSL's audited accounts. Management accounts indicate a further 3.4% growth in the six months January-June 2004. At end-June 2004, these accounts showed that TSL had capital funds of K15.8million and liabilities of K61.5million, representing a capital: liabilities ratio of 20.0%.

### *Lending Performance*

Gross loans to members have grown substantially faster than deposits, recording growth of 17% in 2003 and 25% in the first six months of 2004. The data are presented below, including amounts provided against loan losses and net loan exposures:

Kina millions	Dec 02	Dec 03	June 04
Gross Loans	22.1	25.9	32.4
Provisions	<u>5.2</u>	<u>3.2*</u>	<u>3.2**</u>
Net Loans	16.9	22.7	29.2

\* Provisions partially used for loan write-offs in 2003

\*\* No provision adjustment yet made in 2004

According to management information, TSL had 3,681 loans on its books at end-June 2004, of which 1,326, accounting for 7% of the total amount lent, were classified as non-performing. The net exposure to delinquent loans appeared to be fully covered by loan loss provisions. TSL's average loan size was K8,800 at this time.

### *Administration*

Under powers granted in the Act, the Registrar placed TSL in administration in April 2001. After 14 months under administration by Deloitte, TSL emerged from administration in June 2002 with a new Board and CEO. The new CEO, Mr Michael Koisen, had previously been the CEO of the Police S&L. Many of the non-performing loans in TSL's portfolio date back to the period prior to administration.

### *Supervisory Committee*

It is a requirement of the Act that every S&L has a Supervisory Committee, independent of the Board and Management, to supervise generally and, where necessary, to dismiss any officer or Director. Names of candidates will be available for the General Annual Meeting in March 2005.

## **SLP FINANCING SUPPORT SCHEME**

### *Credit risk*

TSL management has indicated TSL's willingness to take the full credit risk for three year loans to qualifying teacher borrowers, based on a 1:2 savings ratio, to cover 100% of the indicated maximum purchase price of K3,000 for a solar lighting kit. If the SLP is willing to cover the credit risk for the further period beyond this term, TSL would be willing to extend such loans for the five years estimated to be necessary to achieve loan payment affordability.

### *Lending capacity*

On unaudited balance sheet data for 30 June 2004, TSL had unused lending capacity of about K3.7million, sufficient for over 1,200 SLP loans at the maximum of K3,000 each. If the average loan size became K1,500, quite likely with a mix of basic and more sophisticated solar lighting kits at prices between K800 and K3,000, almost 2,500 loans could be offered. TSL's demonstrated deposit growth and recycling of existing loans should steadily augment this capacity.

### *Liquidity*

Apart from the credit risk of a longer than normal loan term, TSL and the Registrar are also exercised by the question of adverse liquidity effects. In other words, even if the credit risk can be alleviated, TSL would still need to recover its loan funds, with interest, within three years to meet potential deposit withdrawals and new loan requests. It follows that a classical guarantee mechanism, whereby the SLP would cover the credit risk but would not automatically replace the funds locked up for the later years, would not meet this concern of the lender and regulator.

### *Risk equalisation*

It is suggested that the most efficient way of providing the requisite support to TSL's credit exposure and alleviating any liquidity constraints, would be by way of a risk equalisation payment by the SLP to TSL. This would, together with regular loan service payments by the borrower, mimic the behavior of a three year loan in terms of both credit risk and liquidity for TSL.

During the first three years, TSL would take the credit risk and absorb any loan losses. If the borrower did not default during this period, TSL would effectively be fully paid out after three years by the combination of borrower's loan payments and the risk equalisation payment, even though the borrower would be due to make loan payments for a further two years. A risk equalisation recovery mechanism would be applied to borrower's loan payments during years 4 and 5, allowing a degree of recycling of the SLP funds dependent on the loan service performance during this period. The SLP funds applied to risk

equalisation would, effectively, become a revolving fund capable of providing ongoing risk equalisation support for new SLP loans once recoveries start to accumulate in Year 4.

During these last two years, the SLP would bear the full credit risk of the remaining loan and TSL would, as lender of record, be administering the loan as agent for the SLP. A legal agreement would ensure that TSL safeguarded the SLP's rights, including foreclosing on any available security, as though the loan were its own.

An example may be helpful:

Loan amount:	K3,000
Term of loan between TSL and borrower:	5 years
Fortnightly loan payment on formal 5 year basis:	K31
Fortnightly loan payment on notional 3 year basis:	K46

Fortnightly payment scheme during Years 1, 2 and 3:

Loan payment by borrower:	K31
Risk equalisation payment by SLP:	K15
Receipts by TSL:	K46

Fortnightly payment scheme during Years 4 and 5:

Loan payment by borrower:	K31
Risk equalisation recovery by SLP	K31

#### *Recycling*

Total risk equalisation payment by SLP:	$K15 \times 78 = K1,170$
Total risk equalisation recoveries by SLP:	$K31 \times 52 = K1,612$

SLP would, for any loan fully repaid by the end of five years, receive more in recoveries than had been paid out to TSL for risk equalisation, reflecting the effects of timing differences and accumulating interest. The recovered amounts could be recycled from Year 4 onwards in support of further loans. Of course, any loans that defaulted during years 4 or 5 could represent a loss to the SLP, depending on the available collateral in the borrower's savings account with TSL. Any crystallized losses would deplete the amount available for recycling.

#### *Payment mechanisms*

For simplicity and to avoid myriad payments, the risk equalisation payment by the SLP to TSL should be made in one amount when loan disbursement by TSL to the borrower occurs.

Risk equalisation recoveries should reflect fortnightly loan payments, comprising interest and principal repayments, by the borrower to TSL in Years 4 and 5. For convenience, these should be accumulated by TSL and paid over to the SLP on a quarterly basis, in arrears.

The net effect of a leading payment to TSL and lagged payments by TSL is to give TSL some free use of SLP money. This benefit should be considered full compensation to TSL for any extra administrative costs of the scheme.

## INCREMENTAL COST MATRIX

Sub-Component	Baseline	GEF Alternative	Increment
Financial Incentives, Credit guarantees or risk sharing mechanism	No GEF support. Only retailers make financing available for household solar kits and these terms are not affordable or leave a remaining down payment that is a barrier to purchase.	Over half (\$520,000) of the requested \$1,000,000 in grant assistance is requested for this central component. This assistance includes TA for the financial institutions to adjust their MIS system to include monitoring of this new financial product. The GEF assistance will share the credit risk with the financial intermediary, 100% risk for the FI in years 1 through 3, GEF financed risk equalisation fund will take the risk for years 4 and 5. The equalisation fund will also assist the FI with its liquidity position thus allowing the FI to offer a 60 months loan under the existing rules of Bank of Papua New Guinea. This longer term finance will facilitate the SHLK purchase at a cost equal to the current cost of kerosene used for lighting purposes. Since no subsidy is involved, the grant amount on-lent by the financial intermediary will be recouped with interest (net any defaults) and thus create a revolving fund which can be used past project closing to finance additional scale-up.	The increment is essentially one of affordability for the prospective purchaser of the SHLK. This has been calculated to constitute a positive net cash flow (previous discretionary monthly income + SHLK monthly repayment – monthly kerosene purchase savings) for the candidate population. This element is central to the creation of a SHLK market in PNG. There is no net capital subsidy or operation subsidy involved in this operation, only a partial risk equalisation and liquidity enhancement for the lender. The financing is critical to creating consumer confidence and an early SHLK market which will grow rapidly (from 500 per year to 2,000 per year) by project closing.
SHLK Product Standards and Product Catalogue Development	No GEF support. The current static situation as regards rural PV systems continues. There are no consistent locally tested and certified product designs or applications and the horror stories about non functioning Government and donor supported applications for schools and government buildings will continue to defray customers from buying their own systems	GEF support, in addition to Australian CTF support, over the first years facilitates the development of an acceptable quality components catalogue. This is an essential element to increase customers confidence in solar house lighting kits	This TA allows for confidence building among potential customers and is essential to market development effort. Creating consumer confidence will allow the SHLK market to expand beyond government employees and create a rapidly scaling-up commercial SHLK market.
Solar Providers Capacity Building	No GEF Support. The one retailer (as opposed to companies which supply projects in bulk) continues to work mostly in isolation to the extent they can stay in business. Operations are restricted to Pt. Moresby.	GEF support in addition to Australian CTF support will facilitate retailers to become ISO 9000 certified, and sell systems with the PV GAP quality mark, which will further increase consumer confidence. Retailers will be asked to provide long term guarantees for the SHLKs.	This will provide incremental investment in the SHLK industry necessary to satisfy growing demand.

<b>Sub-Component</b>	<b>Baseline</b>	<b>GEF Alternative</b>	<b>Increment</b>
Solar Purchasers Capacity Building	No GEF support. There is no program to build awareness among consumers of the potential and advantages of solar house lighting kits over existing use of kerosene or battery charging services. The household market, even the promising market represented by salaried government employees posted to remote areas, remains untapped.	GEF support matched by \$12,000 of in-kind support from Government and over US\$114,000 in support from retailers, allows for concerted effort to raise consumer awareness of solar PV as an affordable rural energy solution. This component also includes a mandatory purchaser training as part of the overall after-sales service program. The project will take advantage of existing media for awareness building and promotion for key target audiences, including Public Service announcements, the Dept. of Education monthly newsletter, PNG Teachers S&L placards and promotions, and of course radio, TV and newspaper spots in the target provinces.	Customer awareness, targeted product promotion, and purchaser training are the incremental elements supported by the GEF grant. These incremental activities will all be designed not only to meet the physical indicators of the project (2,500 teachers) but make sure the kits as purchased are properly looked after and deliver the full amount of energy and carbon savings over their scheduled lifetime.
Solar Regulators Capacity Building	No GEF support, without which the Ministry of Environment will not be able to undertake regulatory development, nor will the industry have the cohesion and promise for growth needed to motivate them to address the battery disposal problem early on. Also the battery importers will have no reason (either regulatory or commercial) to cooperate by agreeing import standards or conditions.	GEF support and support from the Australian Consultant trust fund, supports the Ministry of Environment's early definition of regulations addressing the need for environmental safeguards on the young rural solar PV industry. This support yields a Code of Practice for the industry governing all environmental safeguards associated with PV. It also supports early efforts to find commercial and hybrid public/private solutions to the need for battery recycling on a commercial financially sustainable basis.	The increment is between no regulation of a growing rural solar PV industry and a coordinated program of environmental safeguards worked out cooperatively before the potential for improper battery disposal grows too large to manage.

<b>Procurement Arrangements</b>		
<b>Component/ and Goods/Services Description</b>	<b>Amount (US\$000s)</b>	<b>Procurement Method</b>
<b>Project Management Unit</b>		
<b>Goods</b>		
PCs and software	5	shopping
<b>Services</b>		
Procurement and Financial Management Training	25	Sole Source to be defined by Financial Management Specialist and Procurement Specialist
Project Management related training & Consultants	70	CQS
<b>Financial Equalization/SHLK Purchase</b>		
<b>Goods</b>		
	0	
<b>Services</b>		
Consulting service for MIS for TSLS	20	Sole Source (Adding module to existing software)
<b>SHLK Product Certification</b>		
<b>Services</b>		
PV-GAP and QA Consultants	48	CQS
<b>Provider and Purchaser Capacity Building</b>		
<b>Goods</b>		
PCs for Training Purposes	12	Shopping
Demonstration SHLK	5	Shopping
<b>Services</b>		
Design and Publication of Brochures and Product Catalogue	10	Shopping
Transport and Travel to/from demonstration sites	24	Shopping
Outreach, Training & Workshops Consultant, Design, Dev. and Prod. of Training prgm +Trg of trainers	79	CQS
Supervision of Production of Training	24	CQS
Publishing of Manuals with CDs	25	Shopping
Design, Testing and Implementation of MIS system for Participant Monitoring	25	Shopping
Training and TA for PMU	70	CQS
Provide Evaluation Services for Mid-term Evaluation	30	CQS

### IMPLEMENTATION AND DISBURSEMENT ARRANGEMENTS

The Government Departments have agreed that PNG Sustainable Development Program Ltd. (PNGSDP), a private company with part Government ownership, will be the executing agent for this project. PNGSDP has delegated this task to their energy subsidiary: PNG Sustainable Energy Limited (PNGSEL). PNGSEL will house the Management Unit (PMU) responsible for the management of the project. This includes tendering, contracting and supervising the work of consultants or consulting firms; establishment and maintenance, over the life of the project, of the product catalogue which lists products that are eligible to be purchased with the financial package offered under this scheme; supervision of all components; conduct of all monitoring and evaluation; management of reporting incentive payments to SHLK owners; operation of the special account opened for this project; and reporting to the Advisory Committee of GOPNG agencies established to oversee the project.

#### PROJECT IMPLEMENTATION PLAN

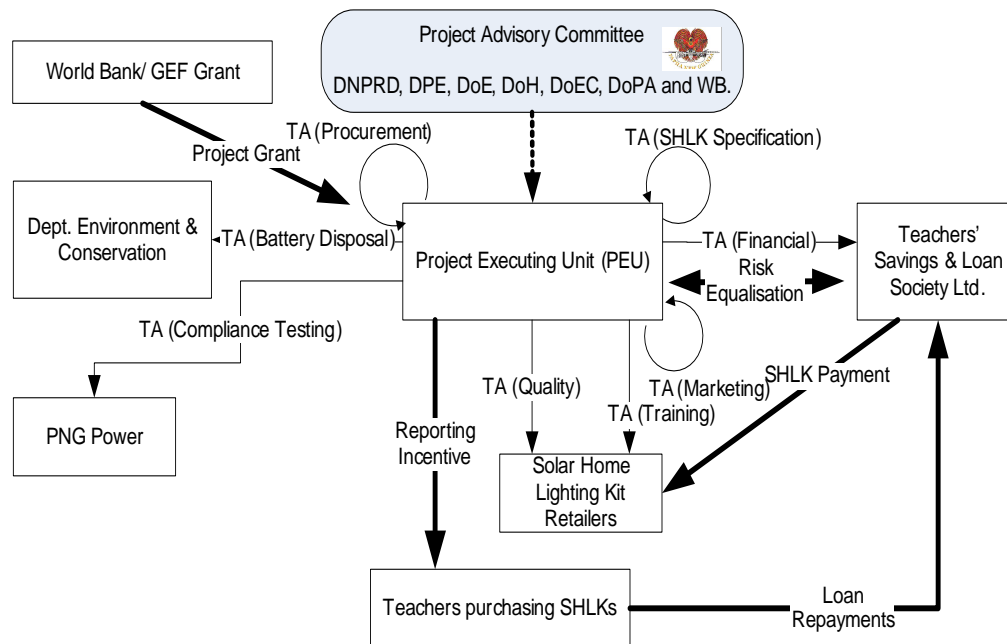
DURATION OF PROJECT (IN MONTHS):										
ACTIVITIES	PROJECT-MONTHS									
	6	12	18	24	30	36	42	48	54	60
Completion of project activities	6	12	18	24	30	36	42	48	54	60
Project Implementation Manual and legal agreement between PNGSDP and TSLA	■									
Procurement training of PNGSDP	■									
Additional project related Training for PNGSDP		■		■						
Catalogue with certified components	■									
Interactive video computer based training program completed		■								
Marketing of SHLKs and training of purchasers		■	■	■	■	■	■	■	■	
PNG Power training and regulation in place, authorizing PNG Power to be the certifying institution in PNG for Solar PV components		■	■	■	■	■	■	■	■	
Loan Finance with terms of 5 year for SHLK for teachers and health workers available		■	■	■	■	■	■	■	■	■
Number of SHLK sold (incremental)		90	200	500	900	1500	2300	2500	3000	3500
Retailers ISO 9000 certified and qualify for PVGAP Mark		■	■	■	■	■				
Draft Battery recycling regulations distributed for comments	■	■								
Battery Recycling Regulations Adopted			■	■						
Battery Recycling in Place					■	■	■	■	■	■

To review the performance of the solar lighting kit in the field, teachers will receive from the PMU a bonus payment directly into their savings account in return for a six monthly SHLK owners' report. The information contained in this report will be used to monitor scheme effectiveness and refine the product catalogue.

The project activities are described in paragraph 4. The project implementation plan below shows the timeline for the major activities.

Other organizations will play important parts in project implementation, including the Department of National Planning and Rural Development (DNPRD), Department of Petroleum and Energy (DPE), Department of Education (DoE), Department of Health (DoH), PNG Power, PNG Teachers Savings and Loan Society, Ltd, Department of Environment and Conservation and Department of Provincial Affairs. The reporting relationship and money flow for the project will be as shown in Figure 1.

**Figure 1: Funds flow for PNG Solar Home Lighting Kit (SHLK) Project**



The financial intermediary identified for this project is the PNG Teachers Savings and Loan Society, Ltd. The Savings and Loan Society is a co-operative financial organization incorporated and registered under the Savings and Loan Societies Act of Papua New Guinea (See Annex 2). Active membership of the Society stands at approximately 14,000 members, all of whom are teachers. The Society operates a computerized MIS system (FCS supported from Australia through Credit Union Support Services Limited) with savings and loan repayments being facilitated through payroll deductions. The Society now lends to members on a one-to-two savings-to-lending ratio for purchasing products such as a solar light kit. The repayment term is typically 12 or 24 months for loans of this nature. In order for the monthly repayment to fall within the range of affordability identified by studies of household expenditure the term of the loan needs to be extended to 60 months. Society management has indicated they would be

willing to consider offering a longer term product provided they can maintain the existing quality of their loan book, don't incur further risk exposure and that their liquidity requirements aren't endangered<sup>18</sup>. As the Society is constrained by the legislation and is unable to reflect increased risk in higher interest rates, the project has, in close association with management of the society developed a risk equalization package as described in Annex 2. After the first year of the project, the scheme might be extended to other qualified Financial Institutions.

---

<sup>18</sup> Letter from Managing Director Teachers Savings and Loan Society to Mahesh Sharma, Country Manager World Bank, August 12 2004.

### DISBURSEMENT SCHEDULE

Projected Expenditure Table	Total	2005		2006		2007		2008		2009	
		Apr-Aug	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Risk Equalization Fund	500,000		18,000	22,000	60,000	80,000	120,000	160,000	40,000		
MIS system FI	20,000	20,000									
Demonstration Models	5,000	5,000									
Transport and Travel for Demos	24,000	4,000	4,000	4,000	4,000	4,000	4,000				
Design and Production of ICVT	75,000	25,000	50,000								
Publishing of Manuals with CDs	25,000		25,000								
Supervision of Production of Trng	24,000	3,000	21,000								
PCs for training purpose	12,000		12,000								
Training for Trainers (retailers staff)	4,000		4,000								
Participant Monitoring	75,000		25,000	419	930	2,325	4,185	6,975	10,695	11,625	12,846
Brochure and Prnt of Catalogue	10,000		5,000					2,500		2,500	
Assistance to Retailers for PVGAP	48,000		24,000	24,000							
Mid term evaluation	30,000					10,000	20,000				
Procurement+ Fin. Mgnt Tng PMU	25,000	15,000	10,000								
Prijt Mgnt Trgn + TA	75,000	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Miscellaneous	40,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
<b>Total</b>	<b>992,000</b>	<b>83,500</b>	<b>209,500</b>	<b>61,919</b>	<b>76,430</b>	<b>107,825</b>	<b>159,685</b>	<b>180,975</b>	<b>62,195</b>	<b>25,625</b>	<b>24,346</b>

## INTEGRATED SAFEGUARDS DATA SHEET

INTEGRATED SAFEGUARDS DATA SHEET	
<b>Section I – Basic Information</b>	
Date ISDS Prepared/Updated: August 15 2004	
<b>A. Basic Project Data (from PDS)</b>	
I.A.1. Project Statistics	
COUNTRY: Papua New Guinea	PROJECT ID: P088940
PROJECT: Teachers Solar Lighting Fund	TTL: Antonie de Wilde
APPRAISAL DATE:	IBRD AMOUNT (\$m):
BOARD DATE: NA [GEF CEO endorsement to be requested 1/31/05]	IDA AMOUNT (\$m):
MANAGING UNIT:EASEG	SECTOR: Energy
LENDING INSTRUMENTS: GEF MSP US\$992,000	STATUS: Decision Mtg

I.A.2. Project Objectives (From GEF MSP Brief)

- Remove barriers to the wide spread use of solar photo-voltaics for electricity use in rural areas and reduce the use of kerosene and other fossil fuels for lighting purposes.

To achieve this objective the project includes the following sub-objectives

- Provide a sustainable financial package which will make the purchase of solar lighting kits affordable for teachers and health workers in this project and for the general public as soon as the project is replicated by the market.
  - Building capacity within the PNG renewable energy industry, by regularly producing a catalogue with certified solar PV components.
  - Building a high quality retail market for solar lighting components.
  - Building consumer awareness and confidence in the use of solar lighting
  - Promoting proper disposal of lead acid and other batteries associated with solarPV
- Improve the delivery of education in rural PNG through longer retention of teachers placed in rural schools.

#### I.A.3. Project Description (From GEF MSP Brief)

The immediate outcome of the five-year pilot operation will be the provision of solar house lighting kits to 2,500 teachers located in five provinces with low potential for developing electricity grids, together with the integrated and comprehensive support network needed to ensure sustainability for the five-year terms of the loans and the 20-year life of the solar units. The rationale of the project is that overcoming persistent barriers to renewable energy use in this project will result in a market based rapid replication of the project and significant increase in the use of renewable energy.

The project will be undertaken in five regions of PNG in order to test the model under varying social, community and institutional environments. The GOPNG's Department of Education (DoE) has nominated the participating provinces as Milne Bay in Southern Region, New Ireland in New Guinea Islands Region, East Sepik in Momase Region, Western Highlands in Highlands Region and Western Province. These five provinces have over 800 rural primary schools served by close to 5,000 teachers.

The initial beneficiaries of this project will be the individual teachers (and health workers), and their families, who have been posted to remote areas with no power supply and few basic amenities.<sup>19</sup> Another important class of beneficiary is the children attending rural primary schools or the community being treated in rural health clinics who will be exposed to the benefits of modern energy services and more significantly, the improvements in education and health care stemming from longer retention of better-qualified government employees.

The renewable energy industry and its current and potential customers in PNG will benefit from the considerable additional investment in solar energy due to this project. The principle benefits of such additional solar energy investments will be an overall cost reduction in the price of solar photovoltaic applications in rural areas, as the result of two separate but reinforcing effects: (a) direct cost reduction through scale up of the market and thereby reduction of overhead and transaction costs for companies; (b) specific industry and business capacity-building efforts to be focused on PNG solar retailers, which together with the increased market size should allow companies to get a higher volume of business. The net benefit of these increased market opportunities and improved industrial capacity will be more advanced solar packages available for a wider variety of applications at reduced unit costs and improved levels of performance, better affordability of solar products and equipment through access to credit made easier by exposure of lending institutions such as the initial financial intermediary in this project, Teachers Savings and Loan Society (TSLs) to the technology; and reduced costs of ownership and operation as better quality products are introduced,

With respect to greenhouse gas mitigation, the Project will reduce consumption of both kerosene and diesel by demonstrating that indigenous renewable energy sources are more economical, reliable and sustainable than are fossil fuel-based power supplies. Market assessments conducted to date suggest displacement of 10 liters of kerosene per household per month. Given a kerosene carbon dioxide content of .25 kg per liter, this pilot program could deliver as much as 750 tons of CO<sub>2</sub> annually. With an expected solar kit lifetime of at least 20 years this has the potential to produce emissions savings of 15,000 tons CO<sub>2</sub>.

**I.A.4. Project Location:** (Geographic location, information about the key environmental and social characteristics of the area and population likely to be affected, and proximity to any protected areas, or sites or critical natural habitats, or any other culturally or socially sensitive areas.)

The GOPNG's Department of Education (DoE) has nominated the participating provinces as Milne Bay in Southern Region, New Ireland in New Guinea Islands Region, East Sepik in Momase Region, Western Highlands in Highlands Region and Western Province. The solar house lighting kits will be installed on existing houses for teachers (and health workers). **This project will not involve any land acquisition, there is no incremental land use and no resettlement. The solar panels will be installed at existing Government owned houses which are not located near protected areas or sites or critical natural habitats or other culturally or socially sensitive areas.**

<sup>19</sup> Teachers are the immediate target population, but Health workers and other GOPNG employees are also eligible.

<b>BI. Check Environmental Classification</b> A [ ], B [ ], C [X], FI [ ], TBD [ ]			
<i>Comments:</i> The environmental incident of possible inappropriate disposal of depleted batteries was identified as an issue that will be addressed			
<b>C. Safeguard Policies Triggered</b> (from GEF MSP Brief)			
The environmental incident of possible inappropriate disposal of depleted batteries was identified as a potential environmental hazard.			
Click on Policy name for brief summary of objectives, triggers and requirements			
Click on Policy reference number for full policy			
I.C1. Table on applicability	Yes	No	TBD
Environmental Assessment (OP/BP/GP 4.01)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Forestry (OP/GP 4.36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety of Dams (OP/BP 4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pest Management (OP 4.09)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Involuntary Resettlement (OD 4.30)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indigenous Peoples (OD 4.20)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cultural Property (OPN 11.03)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Projects in Disputed Areas (OP/BP/GP 7.60)*	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Projects on International Waterways (OP/BP/GP 7.50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

<b>Section II – Key Safeguard Issues and Their Management</b>
<b>II.D. Summary of Key Safeguard Issues.</b> Please fill in all relevant questions. If information is not available, describe steps to be taken to obtain necessary data.
<p>II.D.1a. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts.</p> <p>The potential negative environmental impact of battery dumping was identified as a potential environmental problem. This is not only related to this project, but the Government of Papua New Guinea doesn't have any regulations in place that prohibits or regulate battery dumping.</p>
<p>II.D.1b. Describe any potential cumulative impacts due to application of more than one safeguard policy or due to multiple project components.</p> <p>This is a small very focused project and is limited to facilitating the purchase, installation and maintenance of solar lighting kits for school teachers and health workers on existing Government housing. No land acquisition, no incremental land use and no resettlement will take place in this project.</p>

\* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas

<p>II.D.1c Describe any potential long term impacts due to anticipated future activities in the project area.</p> <p>Long term impacts of this project are only related to the potential negative impacts of a relative small number of batteries being dumped.</p>
<p>II.D.2. In light of 1, describe the proposed treatment of alternatives (if required).</p> <p>Given the present state of technology there are no feasible alternatives for storing electricity than batteries</p>
<p>II.D.3. Describe arrangement for the borrower to address safeguard issues:</p> <p>The project will support the establishment of a Code of Conduct for spent battery waste management in PNG and a battery return mechanism. This will not only mitigate environmental impact of batteries disseminated through the Project but will be extended to include all solar and other lead-acid battery types. The mechanisms to be explored will focus on promoting commercial battery recycling and may include battery branding and a deposit return cycle, in addition to public awareness raising and information on the appropriate disposal of spent batteries.</p>
<p>II.D.4. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people.</p> <p>The project will work with the Department of Environment and Conservation (DoEC) to identify strategic areas for inclusion in a capacity building program that primarily focuses on the development of a self funding regime to mitigate the environmental incident of inappropriate disposal of depleted batteries. This includes the development of Codes of Conduct and other regulatory tools and a commercially viable battery return/refund cycle to promote proper battery disposal. Such policies and regulations will effect the importers of new batteries and exporters of depleted batteries. In drafting the regulations the DoEC will have regular consultations with these groups to facilitate a smooth acceptance of the regulations.</p>

<p><b>E. Safeguards Classification</b> (<i>select one</i>). Category is determined by the highest impact in any policy. Or on basis of cumulative impacts from multiple safeguards. Whenever an individual safeguard policy is triggered the provisions of that policy apply.</p>
<p><input type="checkbox"/> S<sub>1</sub>. – Significant, cumulative and/or irreversible impacts; or significant technical and institutional risks in management of one or more safeguard areas</p>
<p><input type="checkbox"/> S<sub>2</sub>. – One or more safeguard policies are triggered, but effects are limited in their impact and are technically and institutionally manageable</p>
<p><input checked="" type="checkbox"/> S<sub>3</sub>. – No safeguard issues</p>
<p><input type="checkbox"/> S<sub>F</sub> – Financial intermediary projects, social development funds, community driven development or similar projects which require a safeguard framework or programmatic approach to address safeguard issues.</p>
<p>F. DISCLOSURE REQUIREMENTS</p>
<p>EXPECTED DATE ACTUAL DATE</p>

<b>ENVIRONMENTAL ASSESSMENT/ANALYSIS/MANAGEMENT PLAN:</b>		
DATE OF RECEIPT BY THE BANK	NA	.../.../...
DATE OF "IN-COUNTRY" DISCLOSURE	NA	.../.../...
DATE OF SUBMISSION TO INFOSHOP	NA	.../.../...
FOR CATEGORY A PROJECTS, DATE OF DISTRIBUTING THE EXECUTIVE SUMMARY OF THE EA TO THE EXECUTIVE DIRECTORS		
N/A		
<b>RESETTLEMENT ACTION PLAN/Framework:</b>		
DATE OF RECEIPT BY THE BANK	N/A	
DATE OF "IN-COUNTRY" DISCLOSURE	N/A	
DATE OF SUBMISSION TO INFOSHOP	N/A	
<b>INDIGENOUS PEOPLES DEVELOPMENT PLAN/Framework:</b>		
DATE OF RECEIPT BY THE BANK	N/A	
DATE OF "IN-COUNTRY" DISCLOSURE	N/A	
DATE OF SUBMISSION TO INFOSHOP	N/A	
<b>PEST MANAGEMENT PLAN:</b>		
DATE OF RECEIPT BY THE BANK	N/A	
DATE OF "IN-COUNTRY" DISCLOSURE	N/A	
DATE OF SUBMISSION TO INFOSHOP	N/A	
<b>Dam Safety Management Plan:</b>		
DATE OF RECEIPT BY THE BANK	N/A	
DATE OF "IN-COUNTRY" DISCLOSURE	N/A	
DATE OF SUBMISSION TO INFOSHOP	N/A	
If in-country disclosure of any of the above documents is not expected, please explain why.		
<b>SIGNED AND SUBMITTED BY:</b>		
<b>TASK TEAM LEADER:</b>	<b>ANTONIE DE WILDE</b>	<b>DATE:</b>
<b>01/18/2005</b>		
<b>PROJECT SAFEGUARDS SPECIALIST 1:</b>	<b>NAME</b>	<b>DATE:</b>
<b>PROJECT SAFEGUARDS SPECIALIST 2:</b>	<b>NAME</b>	<b>DATE:</b>
<b>PROJECT SAFEGUARDS SPECIALIST 3:</b>	<b>NAME</b>	<b>DATE:</b>
<b>APPROVED BY:</b>		
<b>REGIONAL SAFEGUARDS COORDINATOR</b>	<b>NAME</b>	<b>DATE</b>
<b>COMMENTS</b>		
<b>SECTOR MANAGER</b>	<b>NAME</b>	<b>DATE</b>
<b>COMMENTS</b>		

N/A Not Available

BY SUPPORTING THE PROPOSED PROJECT, THE BANK DOES NOT INTEND TO PREJUDICE THE FINAL DETERMINATION OF THE PARTIES' CLAIMS ON THE DISPUTED AREAS (THIS DISCLAIMER APPEARS ONLY FOR PROJECTS TRIGGERING OP/BP 8.60)

## COUNTRY ENDORSEMENT AND CO-FINANCING LETTERS

Official & Endorsing Agency	Endorsement Date	Nature of Endorsement
Valentine Kambori, Secretary, Department of National Planning and Rural Development	Oct 14 2004	Lead Multi-Lateral Development Coordinator
Dr. Wari Iamo, Secretary, Department. of Environment & Conservation	May 28 2004	GEF National Focal Point
Peter Baki, Secretary, Department. of Education	Oct 15 2004	Client Agency
Camillus Midire, General Manager & CEO, PNG Sustainable Development Program Ltd	Dec 30 2004	Executing Entity
Michael Koisen, CEO, PNG Teachers Savings & Loan Society	August 4 2004	Financial Intermediary



**DEPARTMENT OF NATIONAL PLANNING AND RURAL DEVELOPMENT**  
**Office of the Secretary**

Telephone : (675) 328 8302  
Facsimile : (675) 328 8384

Level 3 Vutupindi Haus  
P.O. Box 631, WAIGANI  
Papua New Guinea

14<sup>th</sup> October 2004  
WB. 04. / SOP

Mr. Mahesh Sharma  
Country Manager  
The World Bank  
P.O. Box 1877  
Port Moresby



Dear Mr. Sharma,

**Subject: Support for Teacher's Solar Lighting Project**

Further to my letter on March 15, 2004 conveying our endorsement for the bank to submit to the GEF Council the PNG Rural Energy Fund Project, I like to further endorse that the project is renamed: **Teacher's Solar Lighting Project** and that the project Executive Agency will be the PNG Sustainable Development Program Limited.

We have no objections for the Bank to open a special account with PNG Sustainable Development Program Limited for the administration of this project. I would, however, want the fund management arrangements to be clearly indicated to Government so that we are fully involved in this undertaking.

Thank you for your continued support to the development of Papua New Guinea.

Yours sincerely,

  
Valentine Kambori, MBE  
Secretary



**DEPARTMENT OF ENVIRONMENT AND CONSERVATION**  
**OFFICE OF THE SECRETARY**

7<sup>th</sup> Floor Somare Foundation  
P O Box 6601  
BOROKO, NCD  
Papua New Guinea

Phone: 3250180  
Facsimile: 3250182  
Email: [odir@daltron.com.pg](mailto:odir@daltron.com.pg)

**Mr. Xian Zhu**  
Country Director  
World Bank Office Sydney  
Level 19, 14 Martin Place CML Building  
Sydney NSW 2000  
AUSTRALIA

Date: 28<sup>th</sup> May, 2004  
File: W/File-Sec. Off

Dear Mr. Zhu,

**SUBJECT: GEF PNG ENDORSEMENT LETTER FOR THE MSP PROPOSAL  
ON PNG RURAL ENERGY FUND**

On behalf of the GEF Papua New Guinea – Global Environment Facility of the Papua New Guinea Republic, I would like to confirm that we fully support the proposal on PNG Rural Energy Fund and do endorse the project for the Bank to submit to the GEF Council for their consideration and approval.

I wish you every success.

Yours sincerely,

**DR. WARI IAMO**  
Secretary

Cc: **Mr. Robin Broadfield**  
GEF/WB Regional Coordinator  
East Asia and Pacific Region  
World Bank, Washington DC  
Fax: 202 522 1666



**Department of Education**  
Office of the Secretary

TELEPHONE: 301 3447  
FAX: 301 3554  
DATE: 20 September 2004

FinCorp Haus  
P. O. BOX 446  
WAIGANI NCD  
REF: PS4-3-2

Mr. Mahesh Sharma  
Country Manager  
The World Bank  
P. O. Box 1877  
Port Moresby

**Subject: Support for Teacher's Solar Lighting Project**

Dear Sir,

We have received the latest document upgrade for the solar lighting project for teachers. The most recent version of the documentation remains focussed on supplying improved quality of life support to rural teachers in PNG.

We note that the projects new title will be the 'Teacher's Solar Lighting Project' and that the project Executive Agency will be the PNG Sustainable Development Program Limited.

We have no objections to the recent changes to the proposal and are eager to see the project get to the implementation stage.

Thank you for your continued support to the development of Papua New Guinea

Yours sincerely,

**Peter Baki CBE**  
Secretary

## PNG Sustainable Development Program Ltd

PNG Company No.: 3-44724  
Tel: 675-3203844  
Fax: 675-3203855  
Email: office@pngsdp.com  
Website: www.pngsdp.com

P.O. Box 1786  
Port Moresby  
Papua New Guinea

30<sup>th</sup> December 2004

Ref NDP.15.1

Mr. Antonie De Wilde  
Coordinator  
Asia Sustainable and Alternative Energy Program  
The World Bank  
1818 H Street N W  
Washington, D.C 20433  
United States of America

Accession No.	
F P N	DATE 11/3/04
Action NEW, Ltr, cc	
FILE (Colalpha/Pname or #) Ln/Cr GR/TF ESW Co/Rg Adm Proc	
P088940	

Dear Mr. de Wilde

### ROLE AS EXECUTING AGENCY FOR THE TEACHERS SOLAR LIGHTING PROJECT

This is to confirm that PNG Sustainable Development Program Limited (PNGSDPL) intends to assign the role of Executing Agency for the Teachers Solar Lighting Project, as defined in the MSP GEF brief, to PNG Sustainable Energy Limited (PNGSEL).

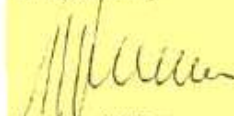
PNGSEL is a subsidiary of PNGSDPL, in joint venture with the SMEC group of companies, and it has been established to be an investor in and developer of sustainable power infrastructure in PNG. The SMEC group provides technical and management support under agreement with PNGSEL. PNGSEL already acts as PNGSDPL's agent for its rural energy projects and for management of PNGSDPL's Sustainable Community Energy Fund.

PNGSDPL makes a commitment to provide funding support to allow PNGSEL bear the management costs of implementing the project. It is estimated these costs will total approximately USD 100,000 over the five year duration of the project.

We look forward to being associated in this project which we believe is close to and consistent with PNGSDPL's own objectives and which has the potential to offer significant benefits for PNG.

We have also written to the Secretary for National Planning and Rural Development to advise him of PNGSDPL intention to assign the role of Executing Agency to our subsidiary company, namely PNGSEL.

Yours, sincerely



Carallus Midire  
General Manager and Acting CEO  
PNG Sustainable Development Program Limited

**PNG Teachers Savings and Loan Society Limited.**

A member of the Federation of Savings and Loans Societies Ltd.

**Office of the General Manager**



Sir John Guise Drive,  
Waigani,  
P.O.Box 6037,  
BOROKO, NCD.  
Papua New Guinea.  
Tel : 325 7599  
Fax : 325 9003

August 4, 2004



**HAND DELIVERED**

Mr. Mahesh Sharma  
Country Manager  
World Bank  
PO Box 1877  
Port Moresby  
NCD

Dear Mr. Sharma,

**Subject: Solar Lighting Project for Teachers.**

Teachers Savings & Loan Society has been in discussions with the Global Environment Facility, through the World Bank, about participating in a proposed technical assistance project to provide some school teachers in Papua New Guinea with solar lighting equipment.

We have been provided with the annexed consultant's report that outlines the way in which the Global Environment Facility might support our provision of finance for this project. We confirm our interest in providing finance on the terms outlined in the report to our teacher members, on condition that each borrower qualifies under this project to purchase such solar lighting equipment and meets our credit criteria.

*August 4, 2004*  
*Page 2*

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Koisen". The signature is fluid and cursive, with a long horizontal stroke at the beginning and a small loop at the end.

**Michael Koisen**  
**Chief Executive Officer**

wb12009  
C:\Documents and Settings\WB12009\My Documents\35984.doc  
04/27/2006 10:47:00 AM