



**United Nations Development Programme**  
GLOBAL ENVIRONMENT FACILITY



To: Mr. Kenneth King  
Assistant CEO

Date: 4 October 1999

Attention: Program Coordination

From: Rafael Asenjo  
GEF Executive Coordinator

Subject: Prescreening of Project Concept: Peru: Renewable Energy  
Systems in the Peruvian Amazon Region (RESPAR)

Enclosed is a concept paper for Peru entitled **Renewable Energy Systems in the Peruvian Amazon Region (RESPAR)** submitted to UNDP by ILZRO RAPS, Peru, for GEF financing under the medium-sized projects initiative.

In accordance with the operational guidance for the preparation and approval of medium-sized projects, we are seeking an initial review by the Secretariat as to the consistency of the concept with GEF eligibility criteria and the Operational Strategy

UNDP will consider this proposal, and the possible allocation of PDF A resources to develop a project brief, after the Secretariat ruling that it is eligible for GEF financing.

We look forward to receiving your view as to the concept's eligibility on or before 25 October 1999.

cc: Mr. Nick Remple, Regional Coordinator, GEF/RBAP (Bureau)

MEDIUM-SIZED PROJECT CONCEPT PAPER: RESPAR PROJECT

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1. Project name: Renewable Energy Systems in the Peruvian Amazon Region (RESPAR)	2. Proposed GEF Implementing Agency: United Nations Development Program (UNDP)
3. Country or countries in which the project is being implemented: Perú.	4. Country eligibility: Perú ratified the Climate Change Convention on June 7, 1993.
5. GEF focal area(s): Climate Change.	6. Operational program/Short-term measure: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.
<p>7. Project linkage to national priorities, action plans, and programs:</p> <p>Perú registers one of the lowest average consumption rates of energy in Latin America even though the country has a wide range of non-conventional energy sources not yet sufficiently assessed and exploited. Nevertheless, the <i>Government of Perú (GOP)</i> has made tremendous progress in increasing the national electrification coverage from 49% to 70% between 1990 and 1998, an increase that benefits more than two million people. The GOP's <i>National Electrification Plan (NEP)</i> has been implemented using two approaches: the expansion of the grid; and the use of non-conventional energy in areas where expansion is not feasible due to high cost. The GOP's second approach uses solar energy through the installation of <i>Solar Home Systems (SHS)</i> to provide energy in remote isolated areas. Based on centralized <i>Remote Area Power supply (RAPS)</i> systems, the proposed RESPAR project will complement the current <i>Renewable Energy (RE)</i> project funded by GEF/UNDP and executed by the <i>Ministry of Energy (MEM)</i>. RAPS technology targets small communities with limited electricity service and uses the current diesel generators along with solar photovoltaic (PV) arrays and advanced energy storage batteries. The results are benefits that substantially increase service quality, provide 24-hour basic electricity, and expand opportunities for productive, economic, and educational activities in higher populated areas. Thus, the proposed project expects to contribute to the development of rural areas by providing electricity and the potential to develop income generation activities with the available energy for the inhabitants of these remote communities. Both projects will provide alternative RE solutions to the energy needs of the Amazon region using <i>a) SHS</i> in highly dispersed households that do not have electricity, and <i>b) RAPS</i> hybrid systems in those communities with small grids powered by diesel generators. In addition, the RESPAR project will have an impact on climate change, reducing greenhouse gas (GHG) emissions and preserving the ecosystem of the target area, the Peruvian Amazon region. RESPAR intends to strengthen knowledge of centralized solar energy systems that use state-of-the-art energy storage batteries, and to lay the foundation for successful large-scale RAPS programs both in Perú and throughout the Amazon region. Most of the targeted area is largely inaccessible other than by boat or seaplane, and it has recently become a national priority region in part for its environmental qualities but also due to its long border with Ecuador. The signing of a final peace agreement in October 1998, which resolved a fifty-year dispute between Ecuador and Perú, has sparked significant international interest in developing the border region now and in the future. Therefore this project intends to embrace these objectives while preserving the current habitat. A momentum is in place for a successful implementation and replication of RAPS systems in the Amazon region.</p>	
<p>8. Status of national operational focal point review: CONAM, in Lima, Perú</p> <p>Submitted: August 31, 1999                      Acknowledged:                      Endorsed: September 02, 1999</p>	
<p>9. Project rationale and objectives:</p> <p>Traditionally, Perú has relied on hydroelectric systems to supply the demand for electricity and currently these systems account for 82% of the energy generated by the national grid system. On the other hand, rural communities have relied on diesel generators to partially meet their electrification needs. In the Amazon region of Perú there are approximately 8,500 rural communities of which around 10% have diesel generators. New</p>	

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initiatives such as the SHS systems being tested by MEM show the GOP's increasing interest in diversification and exploitation of renewables in remote and inaccessible areas. Lack of experience, technical standards, and a legal and regulatory framework for renewable electrification are barriers that constrain private investments. The RESPAR project will strengthen efforts being carried out to remove these barriers through the use of new technology that empower villagers for development. The RESPAR project relies on four different components for the success of the program: adequate implementation of the system to reassure its replication; involvement of the central and local government with the full support of the communities; involvement of NGO's and other agencies to implement a rural development plan; and private sector participation. The objective of this project is to complement the activities to remove the mentioned barriers for the effective application of renewable energies and the successful implementation of the RAPS systems as a complementary option for rural electrification in the Amazon region of Perú.

### RAPS Systems

After comprehensive technical and social assessments conducted by the project executing agency, a technical implementation plan was drawn and five potential communities were identified for pilot hybrid systems. The RESPAR project will install hybrid units in two of these communities in the Loreto region: Padre Cocha and Indiana. These communities were selected mainly because of their awareness of the project impact and their full commitment to support the initiative. Currently these villages use only diesel generators that supply energy for only four to five hours per day. The RAPS systems will provide them with a 24-hour basic electricity service delivering a total of 900 kWh per day (300 kWh per day at Padre Cocha, and 600 kWh per day at Indiana.) The systems will include six 150 kWh per day RPS-150 power modules and six 15 kW photovoltaic arrays (two arrays in Padre Cocha and four arrays in Indiana) into the existing 100 kW diesel generators in Padre Cocha and 200 kW diesel generator in Indiana. Each RPS-150 module consists of a battery system, power electronics and controls package housed in a 6 meter (20ft) ISO shipping container. Each unit is connected to a PV array providing recharge as available and the diesel providing recharged as required. The batteries are gelled electrolyte batteries specifically designed for heavy cycling renewable energy applications, with an average life span of 7-8 years. The batteries are made largely from lead, so it is critical to the environment that they are properly disposed. Due to the significant salvage value, recycling is the best alternative, and old batteries will be brought to a recycling center to ensure that they are properly removed from the communities.

Based on preliminary analysis of CO2 emissions, a saving of 295,108 lbs/day of CO2 is estimated when compared RAPS systems with the prime diesel option working at 24 hours.

At this stage, a pre-feasibility technical study has been completed delineating the engineering design, the project implementation, the system operation and maintenance, as well as an estimated total project cost. A preliminary financial profile shows an expected rate of return 12%. However, the project faces institutional, financial, and technical barriers for its implementation in remote areas of the Amazon region.

### National Interest

RESPAR project has sparked considerable national interest from both the public and private sectors. MEM and DEP plan to use the results of the RAPS systems to strengthen their knowledge base of RE applications and the replicability of RAPS technology in other parts of the country. The Regional Government of Loreto (CTAR Loreto) expects an economic development of the region. The National Fund for Social Programs (FONCODES) is interested in the social development aspect. E. Ferreyros S.A. and Doe Run S.R.L. of Peru will expect profitability by expanding the market for solar energy and battery industries. Both communities—Padre Cocha and Indiana—have expressed strong support for the implementation of this project. Letters of supports from local authorities of both communities have been received, and community leaders are fully cooperating with the executing agency. All of the mentioned institutions have expressed commitment to participate in the development and implementation of this project.

#### 10. Expected outcomes:

The proposed project expects to generate investment and development of RAPS systems from both public and

private sectors, and to lay the foundation for a large-scale RESPAR program. As a result of the implementation of the proposed two hybrid systems, with the help of the private sector, the GOP expects to initially replicate RAPS technology in communities that currently rely solely on diesel generators to generate electricity. For a replication plan to generate 45,000 Kwh per day serving 150 communities, the RAPS systems will save approximately 960,000 tons of CO<sub>2</sub> in a 20-year life cycle period. The project will also improve capacity for building, operating, and maintaining RAPS systems. The educational component of the project will train consumers on the efficient use of energy and will promote income generation activities. These activities will translate into an increased income per-capita, improved living standards, and thus regional development with the consequent reduction of GHG emissions.

**11. Planned activities to achieve outcomes:**

On July 15, 1997 the Directorate of Project Execution (DEP) of the MEM signed a Memorandum of Understanding (MOU) with the International Lead Zinc Research Organization (ILZRO) and the Solar Energy Industries Association (SEIA), two major partners with the know-how and expertise of RAPS design, implementation, operation and maintenance. The parties involved agreed to implement hybrid pilot systems in rural towns in the Amazon region of Perú, and to assess the results of such pilot units in order to replicate RAPS systems in a large-scale program. The implementation of the proposed two hybrid systems will test technical aspects under different scenarios, reduce the dependence on energy generated by fossil fuels, and will constitute the first step towards the utilization of renewable energies from mini grids rather than SHS. The proposed comprehensive pilot project will also produce valuable results, including logistical and technical knowledge on installation and operation, training procedures for local RAPS administrators, and the adoption of financial mechanisms to meet start-up and service costs. Finally, the introduction of RE through RAPS systems will provide real-time operating data in order to determine the regulatory issues that will be addressed in a legal framework to ensure the successful installation of large-scale RAPS programs in Perú and the Amazon region.

**12. Stakeholders involved in project:**

The project will involve the following stakeholders: ILZRO RAPS Perú, the Directorate of Project Execution (DEP); Ministry of Energy (MEM); Solar Energy Industries Association (SEREF/SEIA); CTAR Loreto (regional government); FONCODES (national fund for social programs); local NGOs; Solarex/Ferreyros and Doe Run of Peru; local communities; regional utility companies; sub-populations of vulnerable groups, such as women and indigenous communities.

**13. Information on project proposers:**

ILZRO RAPS Perú is the project proposer. ILZRO RAPS Perú, created in 1999, is a not-for-profit association based in Iquitos,. The members of ILZRO RAPS Perú are ILZRO RAPS LLC and Doe Run of Perú. ILZRO RAPS LLC is a single member, limited liability company formed in North Carolina, USA. The single member of ILZRO RAPS LLC is the International Lead Zinc Research Organization, Inc. a not-for-profit organization which conducts research and implements projects on behalf of lead and zinc users and producers throughout the world. Formed in 1958, ILZRO works in such areas as electrochemistry, coatings, diecasting, chemicals, environment, and health. Doe Run Perú is a Peruvian corporation engaged in the mining, smelting, and refining of lead and other metals.

**14. Information on proposed executing agency:**

With the consent of the Directorate of Project Execution (DEP) of the Ministry of Energy (MEM) of Perú, ILZRO RAPS Perú has been selected as the executing agency of the proposed project. ILZRO RAPS Perú, supported by the International Lead Zinc Research Organization, Inc. through its wholly owned company, ILZRO RAPS LLC, will provide the technical and managerial expertise gained in more than 40 years of operations abroad, including projects successfully implemented using RAPS technology.

## 15. Estimated budget (in US\$) : \$ 2,801,000

• **Contributors**

ILZRO, Inc.:	400,000
GEF/UNDP:	750,000
Regional Government (CTAR Loreto):	500,000
Central Government (DEP-MEM) in-kind:	340,000
Private (Solarex/Ferreyros)	241,000
Co-financing (FONCODES and others):	450,000
Operations (first two years of implementation)	120,000
<b>TOTAL:</b>	<b>US\$2,801,000</b>

**Note:**

Incremental costs will be calculated based on the barriers to be removed by the project; estimation will be completed during project preparation.

**Diesel Only vs. Diesel/RAPS Systems**

	<b>Baseline</b>	<b>Alternative</b>
	<i>Diesel Only</i>	<i>Diesel/RAPS</i>
Hours of electricity	5 hrs.	24 hrs.
Hours of operation diesel-gensets.	5 hrs.	2.75hrs.
Environmental Impact: CO2 emissions	361,307 lbs/day calculated at 24 hours of operation	66,199 lbs/day
Economic Impact: Income generation due to available energy supply	Minimal and restricted	Higher due to 24-hour energy supply
Social Impact: Quality of Life/Reduction of Poverty	Minimal and restricted	Improved





## CARTILLA DE EVALUACION DE PROYECTOS GEF

**Nombre del proyecto:** Nuevos Sistemas de Energía en la Amazonía Peruana

**Ejecutor:** ILZRO RAPS

**Localización geográfica:** Iquitos

**Presupuesto:** US\$ 2'801,000 (contribución GEF 750,000)

Item de evaluación	Calificación cualitativa	Comentario
<b>1. Del proyecto:</b>		
- Definición del problema	OK	Ineficiencia en el uso de combustibles fósiles
- Relevancia del problema	OK	
- Impacto en el problema	OK	Incrementar eficiencia
- Impacto en el nivel de vida de la población	OK	
- Participación de la población	OK	
- Alternativa técnica planteada	OK	
- Sostenibilidad	OK	
- Presupuesto	OK	Adecuado
<b>2. De la propuesta GEF</b>		
- Encuadrado en áreas focales GEF	OK	Cambio climático
- Encuadrado en Programas Operacionales GEF	OK	Eficiencia energética
- Tema prioritario	OK	
- Estructura de costos incrementales (sólo en proyectos definitivos)		

Carta de endoso: SI (X) NO ( )

Fecha de ingreso: 31-08-99

Fecha de evaluación: 02-09-99

Recomendaciones: