

ESMAP Concept Note Form

1. Project Title: An Independent Evaluation of ILZRO/RAPS Renewable Energy Systems in Peruvian Amazon Region		
2. Region or Country: Peru		
3. Task Manager: Xiaodong Wang		
4. Implementation Partners: TBD		
5. ESMAP Strategic Areas:	Energy Poverty	x
	Energy Environment	x
	Market Development	x
6. Implementation Period: 2004		
8. Project rationale and objectives:		
<p>In Peru, around 73% of the population have access to electricity. This still leaves 7 million people without access to modern energy services, mostly located in the Peruvian Amazon Region' villages (10,000), where the rural electrification rate of is less than 5%. Amazon Region has a vast diversity of natural resources and the electricity is necessary for the sustainable use of these resources.</p> <p>Amazon Region is very large with dispersed villages. Grid extension is not an economic option. The logistics of the diesel fuel delivery are expensive and very difficult. Technicians are not available for maintenance. All the current diesel systems are operating inefficiently, supplying electricity only a few hours per day when the fuel is available and when the generator is operative. Diesel generators also pose environmental problems. They emit noxious and greenhouse gas pollutants. For these reasons, the use of diesel generators to provide 24-hour electricity is both costly and environmentally undesirable.</p> <p>Hybrid RAPS systems, using a combination of diesel generator, solar PV, and batteries present a flexible and promising approach to deliver high quality, 24-hour electricity to remote villages. State-of-the-art Batteries developed by CSIRO laboratories are the key component of RAPS hybrid diesel-PV system. These batteries are heavy-duty and they have been designed for rural and remote areas. They are gel batteries, with zero emissions, zero maintenance and an extended life cycle. With an appropriate battery' management, their life cycle could be 10 years. These technical advantages are keys for RAPS operation by 24-hour and for the reduction of GHG emissions generated by prime diesel conventional systems. These systems bring the following benefits:</p> <ul style="list-style-type: none"> • Reduction of the use of diesel fuel, which will reduce current costs • Reduction in environmental damage from diesel exhaust and fuel spillage • Provision of 24-hour electricity, • Enhancement of the quality of life of the population • Enhancement of economic activity in the villages <p>The demonstration site of the ILZRO RAPS diesel/PV hybrid system is in the village of Padre Cocha of 300 households, near Iquitos in the Peruvian region of Loreto, the far northeastern region of the country. The project began in mid-1997 with the signing of a Memorandum of Understanding among ILZRO, MEM, and the Solar Energy Industry Association to bring RAPS</p>		

to the Amazon region. ILZRO commissioned a feasibility study, which was completed in early 1998. A Project Implementation Plan was completed in mid- 1998 and the regional government in Loreto approved funding for the project in October of 1998. A Peruvian civil association to implement the project, ILZRO RAPS Peru (IRP), was founded by ILZRO and Doe Run Peru in Iquitos in February, 1999. Then, funds from the Global Environmental Facility (GEF) and Common Fund for Commodities (CFC) were obtained in late 2000, allowing implementation to begin in early 2001. The electronics and batteries were installed in August, 2002. The Government of the Region of Loreto (GOREL) and GEF provided funding for the photovoltaic panels. The PV was installed in April and the system began operation in start-up mode in May. The local government also provided a 128 kW generator and a new mini-grid system. Technical problems in the grids, the generator, and the electronics were encountered and eventually overcome. There have been no problems with the batteries. The Padre Cocha system has been providing continuous 24-hour per day electricity to the village since October 2003.

The hybrid system is now providing 300 kWh/day of electricity to Padre Cocha, with 35% of the electricity coming from solar PV. A community-based local utility was formed to operate and maintain the system. The consumers currently pay only for the fuel costs. A cost-recovery tariff is now being designed under the UNDP/GEF project. The system provides 24-hour electricity services to residential consumers, as well as productive uses and street lighting. Padre Cocha has an extensive craft industry that will be enhanced by having electricity and is planning to use its electricity to promote ecotourism in the village and the surrounding area. The Central Government (both the Ministry of Mines and Energy, and the Ministry of Economy), Regional Government, Regional utilities and municipalities, are interested in replicating the ILZRO RAPS experience to other parts of Peruvian Amazon region.

The objectives of the RAPS system include: (1) Significant GHG reduction produced by reduction in diesel fuel consumption. (2) Introduction of hybrid RAPS system as an appropriate RET for the Amazon Region of Peru. (3) Promotion of private sector participation in RE projects. (4) Support RE capacity building. (5) Demonstrate the sustainability and replicability of RAPS system.

This independent evaluation is intended to address the following issues:

- (1) Whether the RAPS diesel/PV is the least-cost option to provide electricity services to remote villages in Peruvian Amazon region;
- (2) What the benefits of electricity services are for residential uses and productive use applications to date; and
- (3) Whether and how the RAPS experience can be replicated.

9. Expected outcomes: An independent evaluation of economic and financial assessment of the cost and benefits of the RAPS systems, and its replication potential.

10. Planned activities to achieve outcomes:

- (1) Load assessment of demands for both household and productive use applications
- (2) Technical, economic, and financial assessment of different energy options: 1) diesel alone; 2) diesel-battery hybrid; 3) diesel/PV hybrid; and 4) PV alone to meet the load demand
- (3) Risk assessment and sensitivity analysis of fuel prices, demand growth, and lifetime of key equipment
- (4) Evaluation of costs of different electricity supply options for 5 and 24 hours service.
- (5) Assessment of the benefits of the RAPS system

<p>(6) Evaluation of the financial sustainability of the RAPS system</p> <p>(7) Assessment of institutional design and replication potential</p> <p>(8) Dissemination workshop in Peru</p>
<p>11. Project linkage to national priorities, action plans, and programs: RESPAR Project has endorsement from Ministry of Energy and Mines, Environment National Commission of Peru, Investment National System-Ministry of Economy of Peru, Loreto Regional Government.</p>
<p>12. Stakeholders involved in project: ILZRO Inc., RAPS, Global Environment Facility; Common Fundd for Commodities, UNDP, US Department of Energy; Government of the Region of Loreto, other minor sponsors.</p>
<p>13. Implementation arrangement: Xiaodong Wang is the TTL of this project, working with 1-2 technical and economic consultants.</p>