INSIDE

ILZRO RAPS
peru

A Quarterly newsletter of ILZRO RAPS Peru *May, 2000*

RAPS Batteries – Selection and Charge Control

Batteries are at the core of the RAPS systems for Indiana and Padre Cocha and, to a large degree, their selection, charge control and maintenance will determine the technical success of the power systems.

Battery Selection

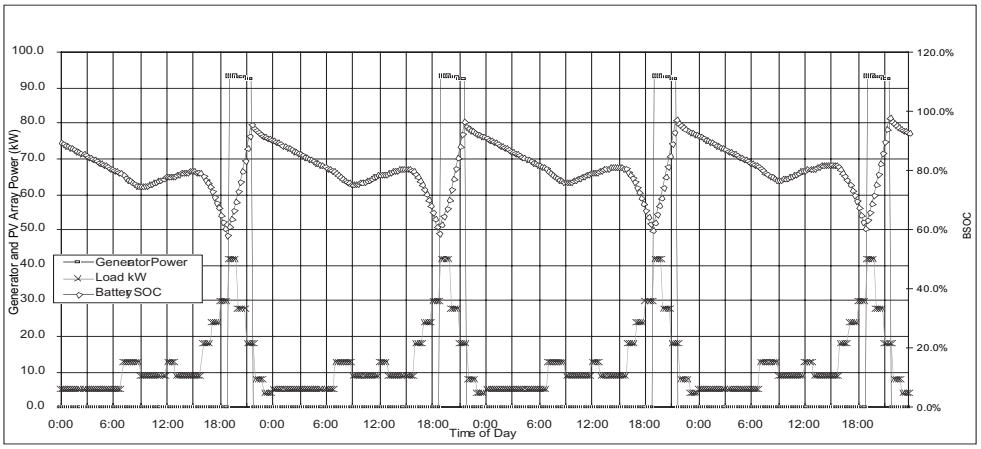
The requirements for batteries in a RAPS system include:

- High cycling capability (one moderate to deep cycle per day)
- Low Maintenance (remote sites, shortage of skilled operators)
- High Efficiency
- High reliability
- Flexibility in installation
- Long Life (!)
- Low Cost (!!!)
- Recycleability (This is especially critical in sensitive environmental areas such as the Amazon Basin)

Other issues such as energy density, battery weight, and rapid charging are not as important with RAPS applications.

The first major decision is between lead-acid batteries and other technologies. Lead acid is the easy winner here because of the commercial stability of the product and their reasonable cost compared with other technologies. Next comes the choice between flooded and valve-regulated (VRLA) batteries. Within the VRLA technology, a further choice is offered between AGM (absorbed glass mat) and GEL (gelled electrolyte) batteries.

Representative Load Profile – Padre Cocha RAPS



Flooded lead-acid batteries are a mature technology, and offer excellent high-cycling products. On the other hand, VRLA batteries offer the advantages of decreased maintenance, installation flexibility, and, especially with GEL designs, the ability to operate at "partial states of charge" for extended periods.

After careful evaluation of all available options, we chose **ENERGEL** Batteries from *Battery Energy South Pacific* for this project. These batteries offer the best cost-performance ratios for all of the above factors. They were developed in conjunction with Australia's CSIRO, a major ILZRO research contractor. They are gelled-electrolyte VRLA batteries with a proprietary plate compression technology to enhance cycling capabilities. They are commercially available in a number of size ranges that fit into the system design. Battery cost and projected lifetime were major considerations in battery selection.

RAPS Operation / Battery Charging

Typical village electrification in the Amazon region of Peru (and in much of the world) offers power for only a few hours each evening, because of constraints on fuel and maintenance costs for the diesel generators. When trying to estimate a load profile for a system with 24-hour power, we assumed that there would be low nighttime use, a secondary morning peak, moderate daytime use, and

...continued on page 4

This article was written by: Tommi P. Tynjälä, M.Sc.(Eng.) Technical Consultant on Energy and Climate Change UNDP-GEF

tommi.tynjala@undp.org

The views expressed in this article are those of the author and not necessarily those of UNDP or GEF.

ENERGY

An Essential Ingredient of Life

For many of us, electricity is a self-evident part of our everyday lives. We expect a turn of a switch to immediately provide us with such essential services as illumination, heating, cooling or access to audiovisual information. Nevertheless, one out of every three persons on our planet – about two billion altogether – is still "unplugged". This does not only mean that one can not enjoy the comfort that electricity bestows; lack of electricity often deprives people from access to important information, limits time available for studying or handcrafting and even leads to health problems due to poor indoor air quality caused by smoke. The communities without electricity may not be able to conserve foodstuff or important medicines such as vaccines and their productivity and thus income can be much below of the real potential.

Energy is not a sector issue but an essential ingredient of life. It facilitates all human endeavor and has a huge impact on the socio-economic development of communities. The United Nations Development Programme (UNDP) emphasizes the close linkages between energy and major global issues, such as poverty, environment, economy and security. What really matters is not a total installed power capacity of a certain country or its overall fuel consumption but the access to necessary energy services by its people, its communities and its industry. These services can be provided in many different ways: centralized or decentralized – using renewable or non-renewable sources. The energy planning consequently turns into finding the least-cost alternative (taking into account the economic externalities such as the costs of pollution) to make adequate energy services available for each specific need.

UNDP is one of the implementing agencies of the Global Environment Facility (GEF). GEF acts in four focal areas related to global environment: conserving biodiversity, mitigating climate change, protecting international waters and phasing out the substances depleting the ozone layer. Within the climate change focal area, energy has an imperative role. GEF seeks to reduce greenhouse gas emissions from current and future energy use by promoting renewable energy, investing in new low-emitting energy technologies and finding ways to conserve energy and improve energy efficiency. Within this context, UNDP and GEF work jointly to find solutions to improve access to sustainable energy services in rural areas of the developing world – UNDP under its paradigm of human development and GEF from the point of view of global environment.

The RAPS project promoted by ILZRO and SEIA is an interesting approach to supply energy for rural communities not connected to the grid. It complements other approaches, such as individual solar home systems (SHS), which provide very basic electricity services for households, e.g. illumination, radio and TV. RAPS are capable of delivering continuous electricity for households and productive activities with very little use of diesel oil. Whereas SHS are often the least-cost solution for sparsely populated areas with modest energy needs, the RAPS are more suitable for villages with relatively dense population and realistic possibilities for productive uses of energy. In many cases, these villages already have a diesel generator with a small grid, which is only used couple of hours a day due to lack of fuel.

ILZRO RAPS PERU has submitted through UNDP a project concept to GEF. The objective of the project is to remove the barriers to sustainable replication of RAPS in Peru and thus abate greenhouse gas emissions. UNDP finds the concept innovative and complementary to its other initiatives in this field in Peru. GEF Secretariat has cleared the concept expressing its consistency with GEF eligibility criteria and the operational strategy. ILZRO RAPS PERU with support from UNDP is currently preparing the detailed project brief needed for the final approval of the project.

ILZRO RAPS PERU has submitted through UNDP a project concept to GEF. The objective of the project is to remove the barriers to sustainable replication of RAPS in Peru and thus abate greenhouse gas emissions. UNDP finds the concept innovative and complementary to its other initiatives in this field in Peru.

A Day In Padre Cocha

The sunrise starts at Padre Cocha, and the canoes get outlined one by one in the horizon. Women wait with excitement, because depending on the fishing done by their husbands, the family will make it through the day. Others will be out in the farms for the crops or getting some fire logs to cook their foods.

That's how starts a day for Gonzalo Mananita and his family, residents of Padre Cocha. Then Gonzalo will go with their sons to look for *apacharama* crust while others will look for clay to get the right mix. Women will later on start making small items that will be sold at the market in the weekend.

These items are made with extreme care, because each and every one of them is crafted differently, exemplifying a variety of animals and human faces. Then, these objects are decorated and painted in the old style, with colored clays that give them a singular touch. The process ends by hardening the items with heat from fire logs.

These are just a few of the duties Gonzalo does during the week. Besides fishing and pottery, he has to find out other ways of work, like helping others with anything he can, in order to obtain some extra income to keep his nine children, whose ages range between one and 12 years old, in school. Some of his sons will most likely not finish school due to enrollment into the military service, or some of his daughters will start a family early.

And life goes on in this way. We all have the same beginning and the same ending: get married and have children; the community keeps growing and growing and we don't have the basic services: electricity, water, sewing systems. The youth don't have many options because due to the technology advances, even a street merchandiser is required to know basic knowledge of computer systems. In addition, since crafting is not well paid, there is not enough income to buy the most essential: food.

And like Gonzalos', children have an uncertain future, many ask themselves, when will I get out of poverty?

This article was written by Mrs. Margarita Davila Kerry, Secretary of the Municipality of Padre Cocha

RAPS Batteries – Selection & Charge Control

...continued from page 1

a primary evening peak. This would cause low load operation of the diesel for most of the day, which would result in low fuel efficiency (per kWh delivered) and increased maintenance costs.

With a RAPS system, the village will operate on batteries for most of the day, with some recharging from the photovoltaic (PV) array. The generator turns on each evening and runs for a few hours, providing energy to the village during the peak load period, as well as recharging the battery. Typical battery cycling under the designed load is about 40% of capacity per day.

With a flooded battery, the battery would need to be brought up to near-full-charge every evening, otherwise capacity would be lost through electrolyte stratification and the plates could undergo sulphation, leading to dramatically reduced battery life.

By contrast, the ENERGEL battery - with regular equalization - is capable of operating for extended periods at "intermediate" or "partial" SOC without damage. This allows the battery to be cycled between 40% and 80% SOC, rather than 55%-95% SOC, which would be much less energy-efficient. The ENERGEL is rated at 2,500 cycles to 50% DOD (depth-of-discharge), so 40% daily cycling would result in a lifetime of at least eight years under normal charging conditions. However, preliminary results by CSIRO have shown that the battery is capable of up to twice this many "partial-state-of-charge" cycles, depending on charge/discharge rate and operating temperatures. ILZRO and CSIRO have requested funding to do a detailed study of the ENERGEL battery under projected RAPS operating conditions in order to optimize the control setpoints for maximum battery utilization. Figure 1 shows RAPS Battery SOC and the load profile during a typical four day period of system operation. Note the intermediate solar recharging and rapid evening charging by the diesel generator.

Summary

The batteries chosen for the RESPAR project represent the latest technologies in both VRLA battery construction and in charging technology for battery life optimization.

This article was prepared by Douglas R. Danley, Orion Energy Corporation.

Orion Energy Corporation has been selected by ILZRO to be the primary contractor for the RESPAR power system design and installation.

Orion Energy Corporation
10087 Tyler Place #5
Ijamsville MD 21754 USA
Tel: ++301.831.1212
Fax: ++301.831.1337
Web: www.orionenergy.com

ILZRO RAPS Peru Project Concept Paper Gets Greenlight From GEF

The Global Environment Facility (GEF) recently gave approval to further develop a project concept paper submitted by ILZRO RAPS Peru in September of 1999. The project concept paper outlined a plan to promote the adoption of renewable energy in Peru as a means of addressing global climate change. Following GEF clearance, ILZRO RAPS Peru has developed a detailed project brief of the $750,000 project and submitted it to GEF through the United Nations Development office in Lima, Peru.

First Climate Technology Initiative/Industry Joint Seminar on Technology Diffusion in Latin America and the Caribbean held March 26-29, 2000

The above-noted conference was held March 26-29, 2000 in San Salvador, El Salvador. The focus of the conference was to seek ways in which government and industry could work together in developing solutions to address climate change. The seminar was arranged around four sessions with the overall objectives being to disseminate information on technology, identify technology needs, removing barriers that hinder technology promotion and promote financing that would make technologies viable. The ILZRO RAPS Peru Project fit well with this concept and was referenced as a case study during the seminar.

Please address questions or comments to:

Dr. Rosalind Volpe,
International Lead Zinc Research Organization, Inc.,
P.O. Box 12036, Research Triangle Park, NC 27709, USA
Tel: 919.361.4647 (ext. 3023) or email: rvolpe@ilzro.org

or

Mr. Marcos Alegre
General Manager, ILZRO RAPS Peru
J + Guzman y Valle 1408, Chacra Rios Norte, Lima 5, Peru
Tel: 511.425.7206 or email:marcale@telematic.edu.pe