Student Program for Under-served Communities
University of Texas at Austin

Funding solicitation
for

Micro hydro power supply to Corcovado National Park Costa Rica

Spring 2012

Funding sought: $18,000

Projects for Under-served Communities (PUC) is a student-led engineering program at The University of Texas at Austin, seeking to make a lasting impact on the global community. We are requesting support of $18,000 from your organization to install renewable energy technology for the Sirena Biological Station in Corcovado National Park, Costa Rica. Providing reliable energy to the area would have several significant impacts on the development of the region as well as making a contribution to the conservation of an irreplaceable rainforest. The amount requested will cover the technical costs of the project, although any level of support is enthusiastically welcomed. PUC strives for not only student involvement, but stakeholder and community involvement as well. To this effect, we encourage funding parties to get involved at any level they desire, both monetarily and cooperatively.

Below we detail our project plan, explain its impact, and describe why we believe our project enhances and complements your own organizational mission.

PUC COSTA RICA




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Our Background

We are four engineering students in Projects for Under-served Communities (PUC) at the University of Texas at Austin. PUC is an innovative engineering course that allows students from multiple engineering disciplines to find solutions for greater global needs. Students in PUC are immersed in a project-based curriculum that matches them with a community abroad that lacks access to basic needs, such as clean water, sanitation, or energy.

The PUC Costa Rica team started with a project proposal including an assessment of the project's feasibility, risk, impact and sustainability. The project assessment was presented to the Service Learning Assessment Board (SLAB), comprised of select senior engineers, UT professors, PUC supervisors and sponsoring party representatives. The board meets four times per year to track and monitor students' progress.

Once the project had been cleared by the board, our team now has begun project design and concept selection, considering economic factors and durability. This includes identifying logistics and problematic areas such as material availability abroad. Students then compose a project schedule to gauge progress and keep project goals on track.

Finally, for 2-4 weeks during the summer, our team will travel abroad to the international site in Costa Rica for project implementation. We will work with the research center's community on a timely and structured schedule to complete the project. To promote sustainability, many efforts are made by PUC to encourage community involvement before, during and after the implementation process.

Projects for Under-served Communities is beginning its third established year, with a repertoire of very successful projects. In 2010, PUC earned *The International Award for Innovative Practices in Higher Education* [University Design Consortium of Arizona State University].

Goals of the Project

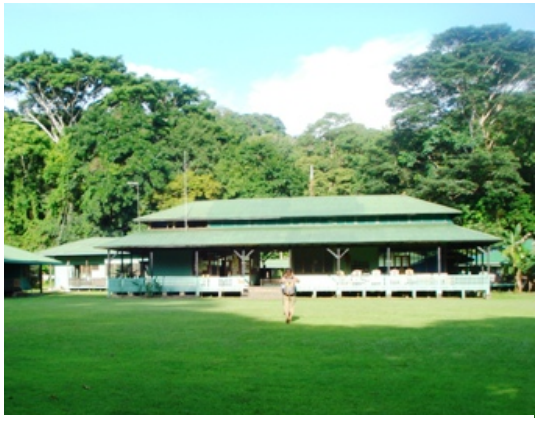
The goal for our project is to provide a micro hydro power source for the Sirena Biological Station in Corcovado National Park. Located in the heart of the premier Costa Rican rainforest, the field station serves as the principal administration base in the park, providing access to the world-renowned rainforest for the local community, researchers and tourists. Since the field station is accessible only by boat, aircraft or on foot, its isolation serves to maintain a low-impact profile, but also impedes provision of critical services.

Currently, Sirena is running on solar power, but because of the region's annual rainfall of up to 250", prolonged cloud coverage often results in low solar power for days at a time. Concurrent to the reduction in sunlight, local streams will flow at higher rates. A micro hydro plant could make

use of the region's heavy rainfall by using flowing water as a renewable source of energy, with minimal negative side effects to the sensitive environment.

Beneficiaries and Stakeholders

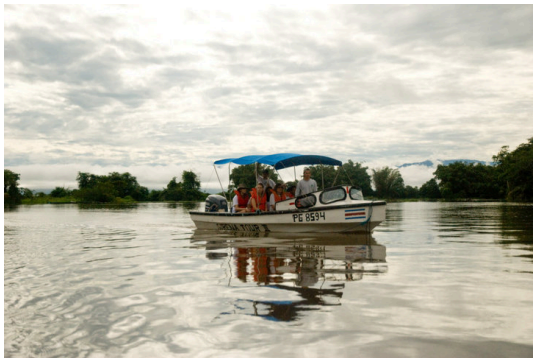
The most immediate and outstanding beneficiaries from the access to reliable energy will be the park staff and researchers working at the field station. In addition, both local and overseas visitors will benefit from the improved facilities. The economy of the Osa Peninsula is highly dependent on the wellbeing of the Corcovado Park, through direct and indirect employment in ecotourism and from the agro-forestry industries that depend on a healthy ecosystem. Provision of critical infrastructure such as reliable power will enhance the abilities of park staff and researchers in their conservation efforts.



Sirena Biological Station

The relevant authority for the field station is ACOSA (Area de Conservacion Osa), which includes administrators and patrol staff whose duties are to prevent poaching, logging and mining within the park. The region has experienced several prolonged episodes of activity in these areas, and the threat increases as the local population grows. The staff is based in the neighboring communities, where they conduct outreach. To adequately perform their duties, the staff is dependent on electricity for communications, security and for proper function of the station's facilities. In addition, approximately 19,000 ecotourists visit the park each year, with many staying at the station on trips spanning from an afternoon to several days. These tourists provide patronage to the local hotel and guide industries, supporting a major component of the Costa Rican economy.

A continuous stream of students and researchers visit Sirena on field courses or as long-term researchers. They come from universities within Costa Rica and around the world, including the University of Texas at Austin, Texas Tech University, Tufts University, Laurentian University in Ontario, Uppsala University in Sweden, and the Organization of Tropical Studies. The Corcovado rainforest provides an unparalleled opportunity for the study of the rainforest ecology because of its extensive biodiversity. In the modern field of science, where there is an ever-growing awareness of the importance of biodiversity preservation, this facility can offer the academic community access to an extremely valuable resource like no other location in the world. Since the 1970's, there have been over 20 PhD's completed at Corcovado National Park, all relying on the facilities of the Sirena station. However, with the advent of other tropical field stations, Sirena needs modern facilities to remain competitive and attract further research.



University of Texas students arriving at Sirena

Corcovado National Park operates on a very limited budget, with a majority of its revenue going to the national treasury rather than being retained by the park. Consequently, very little funding is allocated to infrastructure projects, and the park does not have the capabilities to design or specify technical needs. Sirena's current power system and upgrades have all been installed through donations. A key Costa Rican NGO that continues to support Corcovado is Ambicor

(www.corcovado.org). Ambicor has worked closely with UT and other US and Canadian donors to provide power supply upgrades, new buildings and facilities, and equipment for park guards. We intend to partner with Ambicor to facilitate the project and ensure all local permits and conditions are met.

Description of the power system and proposed solution

Presently, the station's electrical energy demand is 16 kWh/day, with a projected demand of 21-25 kWh/day in the next few years. The source of power comes from 48 x 75W solar panels, which store energy in 16 deep cycle batteries for later use. In cases of low energy supply, an 8 kW standby generator is available, but it is costly and not designed to support the station for prolonged periods. The use of renewable energy agrees with the station's purpose: to protect and preserve the natural resources of the region. Although the use of solar panels is a clean source of energy, it is not always reliable. During the rainy season, overcast conditions result in insufficient sunlight, and in turn, low power supplies. During such times, power outages occur frequently, which can hinder critical operations and development of Sirena's research efforts.

Because the station's existing power supply is deficient, implementing a micro hydro system could make the station entirely self-sufficient. In current conditions, if the solar panels fail to meet the station's power demands, the diesel generator must be used to meet the difference, which is uneconomic, noisy and has a relatively high impact on the environment. Our project proposes to install a 1.5 kW micro hydro generator with the potential to supply Sirena with a minimum of 12 kWh/day. Having two sources of clean, renewable energy that complement each other would allow Sirena to meet its energy needs without generator use. Therefore, not only does the proposed system improve the conditions and facilities at Sirena, but also promotes the core values of the Corcovado Park's rainforest conservation efforts in sustainability and low-environmental impact.

Broader community impacts and future opportunities

Because the Sirena Station relies on the communities and towns in the immediate area for services, supplies and tourist lodging, the implementation of this new system would serve as a model for the betterment of the entire Osa Peninsula. Many community leaders of the nearby area look to the park as an example of progress in the region. Our efforts to find the most cost-effective design will make the implemented micro hydro system a practical model for nearby communities, who can also take advantage of the region's rainfall for energy. In this regard, the center can push forward the practice of renewable energy, and hopefully encourage many others to embrace it by example. At present, only a few communities in the Osa Peninsula have grid electricity, and many villages only served by carbon fuel sources.

UT Field Ecology Lab

Once the facilities are improved and brought to modern standards, this will result in more research and attention to the area, as well as greater interest by foundations and donors. A modern research facility is expected to have a controlled climate for experiments, and continuous power for fridges, freezers, lab equipment and system controls. Many larger and more accessible research stations in other parts of the world now have these facilities. The construction of the micro hydro generator is an important step towards Sirena

being able to perform at its highest efficiency, and become a more developed center of research for sustainability. If this happens, we can expect Sirena's position in rainforest conservation to reflect a higher level of global respect for an essential part of our ecosystem.

Budgetary and Implementation Plans

A micro hydro system works by taking in water through an upstream location. Large debris is removed by filtering the water through a screen. Next, the water is piped downstream to a lower elevation, where the water flow enters a turbine chamber at the piping exit. The water flow turns the turbine, which is connected to a generator that converts rotational energy to electrical energy. The electrical output will be coupled to the existing power system where it can be stored in large battery packs that can be used by the station at a later time.

Item	Price	Quantity	Total
1.5 kW Turbine	$3,000	1	$3,000
Load Controller	$650	1	$650
Step-Down Transformer	$1,200	1	$1,200
Inverter	$2,500	1	$2,500
Lightning Surge Arrestor	$150	1	$150
Pipeline	$500	1	$500
Intake /Penstock	$750	1	$750
Misc. Hardware (piping, wiring, joints, lumber/concrete, tools, cable…)	$500	1	$500
Local electrical contractor (connections & commissioning)	$2,500	1	$2,500
Boat rental to Sirena	$250	1	$250
Advisors' travel expenses	$1600	1	$1600
Sub-total			$13,600
Sales Tax	13%		$1,525
Contingency (20%)			$3,015
Total			$18,150

This budget estimate is strictly for project materials and in-country travel expenses. A technical advisor and Costa Rican cultural advisor will escort us on the trip, with their flight expenses included. All student flight travel, boarding and meal expenses for students will be provided at personal expense or by private fundraising efforts. Construction labor will be performed by PUC students and Corcovado park rangers. Inclusion of student expenses would provide a total budget of $20,000.

Project Road Map

Our goal is to secure funding by Spring 2012 to allow installation of the micro hydro system in May & June 2012. Engineering designs will be based on surveys undertaken by the Ambicor NGO and park staff, including rate of stream flow, and hydraulic elevation. The design of the system will take into account precautions regarding weather and flood damage, ensuring that these factors do not compromise the system or impose unwanted side effects on the environment. A technical advisor will oversee the student engineer designs.

Upon arriving at the Sirena Station with materials, the PUC team and community volunteers will meet with park staff to ensure all protocols and planning steps have been accounted for. We will then scope out the geography of the stream and the surrounding features to determine final details of the system's placement. Quality checks will be performed for every step in construction, during and after completion.

The first step in construction will be to install the upstream water intake structure. Next, we will install piping alongside the stream, mounted above ground level on supports. Next the turbine system will be installed and pipes connected. Water flow and pipe leakage checks will be carried out. The final step will be to connect the turbine to the electrical distribution system. While our group will install the cabling, a licensed Costa Rican contractor from the nearby community will make the final connections. Commissioning tests will be carried out on the entire system, and the park staff will be instructed in operation and maintenance. The system electrical drawings and operations manual will be updated.

The micro hydro system's lifetime will be measured in decades, with routine and inexpensive maintenance provided by the research facility staff and the local contractor.

Water intake structure to be installed on this stream

Why we are asking you for funding support

Our Costa Rica project has been selected and approved by UT authorities, which leaves funding as our only missing component. We believe that your organization shares our ambition for international giving through the empowerment of local communities with sustainable projects. More specifically, our project will inadvertently promote rainforest conservation, and promote a more ethically responsible practice for Costa Ricans, as well as higher quality of life. In addition, your support in this project would advance our education through real world experience, and qualify as a charitable donation. On behalf of the PUC Costa Rica Team, we would like to thank you for your time and interest. We hope that, as the University of Texas' motto so boldly says, what starts here can change the world.

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