Student project will power a Ugandan school

Toggo, a remote village in north-central Uganda, is not connected to the country’s electrical grid, leaving the Toggo International Children’s Center (TICC) – and its more than 800 students and teachers – to rely on an unreliable, primitive power source.

Pastor Steve Trint, the school’s director, said via email: “We have a few solar panels that provide light to a limited degree, and we have a generator that helps pump water, but neither system provides enough power for the entire TICC. When I use my laptop during the day for work, it means that at night, we will not have light for the students. Some buildings don’t even have light at all.”

Even worse, Trint said, is that the lack of power to pump clean well water uphill to the campus means that most students drink from a nearby swamp. The dirty water makes them sick, and the school lacks refrigeration to keep healing medications cool and safe.

Sacramento State electrical engineering majors Will Loria, Troy Miller and Matt Yamasaki, and computer engineering major Tanya Konrad teamed up to come to the school’s rescue with their senior project, “Off-Grid Electricity Generation.”

They built a prototype of a 100-watt solar DC (direct current) micro grid measuring about 4-by-2½ feet. Their dream is to travel to Toggo and teach the TICC staff how to build a 3- to 5-kilowatt system of solar modules, based on the prototype and using materials easily found in the area, to power the entire school with energy from the sun. For instance, the Ugandans have access to the same kind of deep-cycle battery the team hooked up to its prototype for storing the sun’s energy.

“But, the school only has a small amount of power available, about 100 to 200 watts. In our homes, a TV uses 500 watts,” Miller says. “They do a lot with very little. They have a crude method of charging batteries and cheap equipment. There is a knowledge gap: They don’t know what they don’t know. We four have the skill set to provide them with the expertise.”
Miller, who visited TICC last winter on a church mission, and Konrad are members of Rocklin’s Bridgeway Christian Church, which has supported TICC since the school’s inception in 2008. The school opened with 60 students, mostly orphans from the village, and word of its high academic standards attracted children from throughout the region. The student population is now about 800. Some 200 youngsters live on campus in dormitories.

The Rocklin church members’ annual donations ($200 will support one village child; $400 will support a child from outside the village who lives in a dorm) go toward feeding and educating the children, Miller says. “And there’s not a lot of extra money to put toward power.”

The Sac State team estimates the cost of a 1-kilowatt system would be about $6,000, including automated energy management and energy storage for nighttime use. “The cost will be lower as the price of per-kilowatt solar panels comes down,” says Loria. “Right now, the average price with our buying power is about $1.50 a watt. That could fall by 2017.”

If the pastor and his staff can find diesel to pump fresh water from the well, it’s usually prohibitively expensive. So the children and staff get their water from a nearby swamp, using buckets. A 1,000-watt DC micro grid would deliver clean water to the school.

The Sacramento State engineering team has launched a fundraiser site so it can buy components for the Uganda solar project. Donations can be made through Bridgeway Christian Church on the Yaaka Afrika website: http://bit.ly/1mHx21u (Click “solar project” in the dropdown labeled “Expansion and Growth Allocation.”)

“Our project is intended to bring them the power resources they need to let TICC continue to succeed in teaching these kids,” says Miller, the 2014 Dean’s Award winner from the College of Engineering and Computer Science. “Engineering can help lives and change the culture of a region, and educating the children will help to raise them out of poverty.”

To learn more about the Toggo International Children’s Center, go to http://bit.ly/Qjs1RU. For media assistance, contact Sacramento State’s Office of Public Affairs at (916) 278-6156. – Dixie Reid

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