



Shedding a bright light on village needs

David Chandler, MIT News Office
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Bethel High School is a rural school in the tiny landlocked nation of Lesotho, which was once part of South Africa. The school draws students from many surrounding villages, and they live in dormitories during the school year. Though the winter temperatures often drop well below freezing, students in the dormitories only rarely have access to hot water, and the only power in the school comes from a diesel generator, which runs for about four hours a day to power a small computer lab, thanks to diesel fuel provided by the state.

The girls' dorm, however, now has an extra amenity, thanks to work that some MIT students carried out during an 11-month stay last year. Amy Mueller and Matt Orosz, both graduate students in the Department of Civil and Environmental Engineering, designed and installed a concentrating solar array that provides the girls with plenty of hot water.

The system was built last year at MIT's D-Lab, with a lot of help from the D-Lab students. After initial testing here, just getting the components out to the remote site was quite an effort: the roadless community can only be reached by crossing a wide river on small boats, Mueller explains.

Nearby, in the tiny village of Ha Teboho, another concentrating solar heater that Orosz and Mueller installed near the communal village well also provides hot water on demand. "We can easily boil lots of water even during freezing weather," Mueller says. But that's just the beginning of their ambitious project.

The two students, along with others at MIT and local co-workers in Lesotho, have formed an organization called Solar Turbine Group International. Their original plan was for the systems to provide electrical power using Rankine-cycle heatpowered engines, with hot water just an extra bonus. But in their work in the field they encountered numerous mechanical problems with the engine, and they decided to return to MIT to work out the bugs under more-controlled laboratory conditions.

"The arrays performed satisfactorily, but the engines did not," says Orosz. To fix the prob-



Photo courtesy / Solar Turbine Group, MIT

Villagers in Ha Teboho, in the southern African nation of Lesotho, gather to learn about a new concentrating solar generator and hot water system installed by MIT students.

lems, "we figured we could make headway faster in this environment than over there."

In a return visit to Lesotho this summer, they plan to add a more robust version of the generator to the large troughshaped mirror systems, enabling them to produce enough power to recharge cell phones and batteries.

The initial systems are prototypes, designed to be relatively easy to build from inexpensive materials. The engine system, which works essentially like an air conditioner in reverse, is built largely from off-the-shelf car parts that are readily available near the site and can easily be repaired by local mechanics.

After a bit more experience with actually setting up and operating the systems in the villages, the Solar Turbine Group's plan is for local workers who have been collaborating on the project to take over manufacturing and launch a locally based business to produce the units for installation throughout the country.

"We already built a machine shop there and hired local technicians and engineers," Orosz says. "We've set up the seed of a company" that hopefully will become self-sustaining, he says, providing a useful product and generating local income.

The systems are designed to be competitive with existing solar photovoltaic systems or diesel generators for producing power, and provide the added bonus of hot water. Orosz hopes the systems will ultimately cost 10 percent to 15 percent less than the other systems for power alone.

"If the price is even in the ballpark of photovoltaics, we've won," says Mueller, "because you get lots of hot water as well."