

Study finds renewable energy could power more of electricity-scarce Afghanistan

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(Phys.org) -- Afghanistan's growing economy is spurring more industrialization, but a severe energy shortage in the country threatens that progress.

One Kansas State University researcher has proposed a solution. Mahdi Sadiqi, a native of Afghanistan who recently earned his master's degree in electrical engineering, has found that Afghanistan should use more renewable energy to [power](#) the country.

Access to [electricity](#) in Afghanistan is limited and only found in urban areas. More than 80 percent of the 29 million people in Afghanistan do not have access to electricity, and about 70 percent live in rural areas. Rural [community members](#) are forced to use wood, diesel and [kerosene](#) as sources of energy for cooking, heating and lighting.

"Right now in rural communities, one school or one house might get power from wind or solar, but we do not have these sources working together to create an entire system for communities," Sadiqi said.

Some power is sporadic, giving customers access only four or six hours a day, and most of it comes from elsewhere. In 2011 Afghanistan imported 73 percent of its electricity from neighboring countries.

Furthermore, expanding the [power grid](#) to mountainous rural areas is nearly impossible.

"The central power authority is already having trouble taking care of everybody's needs in Afghanistan, and there are often electricity shortages," said Anil Pahwa, professor of electrical and computer engineering and Sadiqi's adviser. "Adding new customers would be an extremely difficult proposition, and the infrastructure does not exist. Alternatives must be found."

Sadiqi discovered a viable alternative. He created model power systems in the province of Bamiyan in the northern part of Afghanistan. He used the computer software Hybrid Optimization Model of Electric Renewable, or HOMER, developed by the U.S. Department of Energy's National Renewable Energy Laboratory.

He found that the most ideal solution is a [hybrid system](#) powered by [renewable resources](#), including micro-hydro and solar, and a battery backup.

With significant amounts of snow during the winter and sun during the summer, this system could be used throughout the year, Sadiqi said. Wind was not suitable for the selected site because of low wind speeds.

The ideal model would implement energy curtailment a few hours per day for each customer to reduce the cost of generated electricity, according to the study, encouraging community members to find ways to limit their power usage.

More renewable electricity in Afghanistan could reduce poverty and deforestation, and improve health care, living standards and education, Sadiqi said.

"By having electricity, a student can use more light to study until midnight. I remember I often studied under the moonlight if I had to," he said. "With more electricity, students could access technology using a

computer and the Internet, while community members could access news to stay informed."

Sadiqi said he hopes his research will encourage private investors and local community members to take advantage of Afghanistan's renewable energy potential.

"I want to show private investors, the government, community members and nonprofits that Afghanistan has enough [renewable energy](#) sources that can be integrated affordably in our communities," he said. "I could even see community people creating cooperatives to get involved and create projects in their own villages."

Provided by Kansas State University

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