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Engineering alum works to bring more electricity to Africa

For some people, going “off-grid” means taking a voluntary respite from phone and email. But for countless others around the world, off-grid means routinely having to go without electricity for days, weeks or longer.

The situation is particularly burdensome in Sub-Saharan Africa, where about two-thirds of the population – more than 600,000,000 people – don’t have access to a reliable power source.

This used to be the case for Abdrahamane Traoré, who graduated from Oakland University in April with a Ph.D. in Systems Engineering.

Inspired Innovation

Born in the West African nation of Mali, Traoré grew up in an off-grid community near the capital city of Bamako. In the evenings, he would study his lessons by the light of a kerosene lamp or walk several blocks into town, where street lights shined brightly enough for him to read his textbooks. He was fascinated by electricity and would tinker around at his house, rigging up lights and fashioning headlamps using disassembled flashlights, wires, batteries, cardboard and rubber bands.

“I was always curious above and beyond the classroom,” said Traoré. “I would go to the French Cultural Center in Bamako and read math and science books, and Do-It-Yourself books that showed how to take things apart and put things together.”

After graduating from high school, Traoré immigrated to United States. Despite not knowing English when he first arrived, he enrolled at Mott Community College in Flint and went on to earn a bachelor’s and master’s degree from Kettering University. In the fall of 2012, he came to Oakland University to pursue a Ph.D. in Systems Engineering.

He said he was drawn to OU’s program because it combined electrical, mechanical and computer engineering, and fostered strong relationships with industry.

“I always wanted a Ph.D. that was practical, not just academic,” he said. “One where I could use academic principles to solve an existing problem in collaboration with industry.”

Creative Collaboration

The problem Traoré wanted to solve was a familiar one. He wanted to bring reliable power to more people in Africa. For his dissertation, he worked with a local energy company to help bring electricity to residents of an apartment complex in Nigeria.

During the nine-month project, Traoré worked with engineers to optimally design a solar/wind/battery hybrid microgrid for the complex.

“The design is driven by the (energy) demand, which



Abdrahamane Traoré stands near the wind/solar/battery microgrid he helped optimize at an apartment complex in Nigeria. The project was done in collaboration with a energy company and was part of Traoré’s dissertation for his Ph.D. in Systems Engineering.



Traoré is pictured with children in Madagascar, where he went to work on a project supplying solar and battery energy to 100 villages. The project is part of a government and industry collaboration to bring more sustainable energy to the country.

which would add cost, and you avoid undersizing, which would cause reliability issues.”

Traoré and the engineers conducted extensive research to estimate the complex’s power needs at each hour of the day.

In addition, Traoré worked with his faculty adviser, Dr. Mohamed Zohdy, and then-Systems Engineering Ph.D. Candidate Hatem Elgothamy, to create an algorithm for determining the most efficient configuration of wind, solar and battery power – thus ensuring reliability while containing cost.

According to Zohdy, this was a prime example of how theory and practice can come together to achieve a social good.

“Algorithms are highly theoretical,” he explained. “But they are very useful when applied to real-world problems, especially in situations like this where people are being helped.”

Values-Driven Vision

The microgrid was fully operational by the end of 2017 and supplies power to 10 households. It’s an energy system that is affordable, reliable and environmentally sound.

“Before (the microgrid was installed), they were depending on diesel power, which is noisy and costly and bad for the environment,” Traoré said. “The new system provides 100 percent clean and renewable energy.”

Traoré added that he knew education was the key to a better life for himself and his family. He credits his parents for imparting values that nurtured his desire to help others.

Three weeks before his graduation, Traoré went to Madagascar to work on a government and industry supported [project supplying solar and battery energy to 100 villages](#). He plans to move back to Africa to be close to family and continue bringing power to the continent.

“I never forgot where I came from,” he said. “I never let go of my values. They are the reason I pursued my education, and they are the reason I will use what I have learned to make life better for others.”



Traoré is shown in front of a solar microgrid in Madagascar.



Traoré and his faculty adviser, Dr. Mohamed Zohdy, are pictured at commencement.