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Promoting Smart Microgrids in Morocco

The Challenge

To increase its energy security, Morocco launched an ambitious renewable energy strategy with the goal of increasing the country's use of solar, wind, and hydropower energy sources to 52 percent by 2030.

Integrating renewable energy sources and increasing energy efficiency in buildings can play a significant role in helping the country achieve its energy targets. In Morocco, buildings are responsible for 28 percent of electricity consumption.

How PEER Researchers are Tackling the Issue

The use of Smart Grids on buildings that use sensors and software to automate processes and reduce energy use is an emerging technology in Morocco and across Africa. Smart Grids both integrate renewable energy sources and increase efficiency. Unlike traditional electrical grids, Smart Grids provide real-time feedback to utilities about electricity consumption. Micogrids, a component of Smart Grids, further accelerate energy efficiency in buildings by promoting “context awareness,” meaning that electrical appliances automatically turn on and off based on contextual factors like temperature, humidity, and light.

To that end, the Partnerships for Enhanced Engagement in Research (PEER) researchers Dr. Mohamed Riduan Abid, Dr. Mohamed Bakhouya, and Dr. Khalid Zinedine from Al Akhawayn University, International University of Rabat, and Chouaib Doukkali University, respectively, paired up with Driss Benhaddou from the University of Houston and created a plan to deploy a holistic platform that implements a real-world Microgrid testbed on a “smart building” at one of Al Akhawayn University’s buildings.

The researchers established multiple testing sites across universities, allowing the team to conduct research under multiple climate conditions focused on three components: integration of renewable energy usage, optimal energy storage strategies, and a control system that is more responsive to changes because it uses real-time data.

The testing helped the team refine the technology for the project’s final integration, which served as a prototype -- a model easily migrated and adaptable that can leverage green energy and energy efficiency in smart buildings in Morocco.



Project Impact

“We focused all of our effort on research and development (R&D),” said PEER awardee Dr. Bakhouya of the International University of Rabat.

Once the researchers have completed the R&D phase, he said, the team plans to engage with and transfer technology to industry.

One of the project’s unexpected successes was that the team was able to deploy almost all aspects of the technology at the first Solar Decathlon Africa (SDA), a three-week international collegiate competition aligned with Morocco’s energy objectives that aimed to promote the use of renewable energy technology in buildings.

The decathlon competition team included 50 university students from the International University of Rabat, as well as students from the Technische Hochschule Lübeck (THL) in Germany, and a consortium of three universities in Senegal (Architecture Collège Universitaire, Institut Polytechnique Panafricain, and Centre Sectoriel de Formation Professionnelle du Bâtiment et des Travaux Publics). The students designed, constructed and deployed a net-zero smart house from scratch, using all locally-sourced materials. The team won first place in architecture and second place in sustainability, promoting the technology at the national level.



“We have had a great impact on education, great impact on the scientific community, and impact on society,” Dr. Bakhouya said. “When families visited the solar decathlon, they saw that this is something they can do.”

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Project website: https://sites.nationalacademies.org/PGA/PEER/PEERscience/PGA_174213

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