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ASU students and staff unveil new hardware for world's only solar-powered digital library

TEMPE, Ariz. — The world's first — and only — digital library with integrated solar power is getting a compact new design this week, as [Arizona State University's SolarSPELL Initiative](#) unveils new hardware engineered and created by ASU students, faculty and staff. SolarSPELL's offline digital libraries are implemented with partner organizations around the world to empower lifelong learning and build the skills needed to find and evaluate information in places with little to no internet access.

For the last nine years, SolarSPELL libraries have been made using off-the-shelf materials, but in 2019 the initiative began designing its own components to better meet users' needs. The [innovative new hardware](#) features a streamlined case that is easier to use and more durable than its predecessor. Made with recycled plastic, the compact new case is shock-, heat-, dust-, and water-resistant.

"What we try to do with SolarSPELL is to provide something that doesn't require expertise to set up or maintain, something that will just work and continue working in the long term after we leave," said Bruce Baikie, one of the initiative's co-founders and co-directors. "That extreme durability and reliability is important for our users, many of whom live in rural and remote places."

Inside, the case contains a patent-pending charge controller engineered by students at ASU's [Ira A. Fulton Schools of Engineering](#) and staff at its [Core Research Facilities](#). The advanced charge controller uses MPPT (maximum power point tracking) to maximize the amount of power extracted from the solar panel.

In order to help users determine the optimum time and place to charge their library, the team designed the charge controller to monitor voltage and amperage and then developed an offline web interface — accessed via the library itself — that shows users how much power is flowing into or out of the solar panel.

Designed to look and feel like using the internet, the SolarSPELL digital library uses a [Raspberry Pi](#) microcomputer to offer up the library via a Wi-Fi hotspot to which any Wi-Fi-enabled device can connect. The new charge controller was engineered to work with the Raspberry Pi 3 Model A+ by plugging into its general-purpose input/output (GPIO) pins. In 2023, SolarSPELL became one of 162 products to be granted official '[Powered by Raspberry Pi](#)' status.

In addition to the case and charge controller, the initiative worked with manufacturers to design the photovoltaic panel and lithium-ion battery to meet its size, material, voltage, and wattage/ampere specifications. They also designed an on/off circuit board to enable push-button on and off as well as an LED battery indicator display.

Laura Hosman, a SolarSPELL co-founder and co-director, said it was important to the initiative to involve students in this redesign: “SolarSPELL at its core is an education initiative — our libraries are created by learners for learners.”

The team engages about 150 students every year in every aspect of its work — from engineering and content curation to training design and data analysis. “We’re committed to providing ASU students with opportunities to engage globally, behave entrepreneurially and carry out work that has an impact — to transform society,” said Hosman.

The new SolarSPELL libraries make their debut this year in Arizona and Rwanda, where they are being implemented to improve access to information for health and agriculture professionals working in remote locations.

In Arizona, the initiative is working with [Hopi Cancer Support Services](#) to empower health workers serving Hopi and Navajo communities with a library of culturally relevant cancer education resources.

Meanwhile, the SolarSPELL team is working with [B2R Farms](#) in Rwanda to promote sustainable agriculture throughout the country. Together, they trained a cohort of agriculture apprentices, who will use the digital library in their work with government extension agents to provide technical assistance to smallholder farmers.

Already the team is working on enhancements to the charge controller to make the next batch of SolarSPELL libraries even easier to produce, but they also plan to collect user feedback with their partners to find more areas of improvement. “We build a monitoring and evaluation plan into all of our projects so that we can continue to make our libraries better for our users — whether that’s through the content, the software, the training or the hardware,” said Baikie.

Since 2015, the ASU SolarSPELL Initiative has implemented 597 libraries in 15 countries around the world, training 960 in-field trainers to reach an estimated 300,000 learners. Of all users they’ve surveyed, 100% have reported that the SolarSPELL library has helped them do their jobs more effectively.

To learn more or get involved with the ASU SolarSPELL Initiative, visit solarspell.org

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About the ASU SolarSPELL Initiative

The ASU SolarSPELL Initiative empowers offline communities globally by providing localized libraries and building 21st-century skills that people need to make informed decisions, increase their self-reliance, and improve their quality of life. SolarSPELL (Solar Powered Educational Learning Library) combines curated digital libraries; solar-powered, offline technology; and training to build information literacy and internet-ready skills in offline environments — focusing on the half of the world that remains unconnected. The SolarSPELL digital library mimics an online experience by generating its own offline Wi-Fi hotspot to which any Wi-Fi-capable device (smartphone, tablet, laptop) can connect to freely, and safely, surf the library's tens of thousands of open access resources. Our team works closely with in-field partners to identify local information needs, carefully curate relevant content, and continually improve our collections across three sectors: education, health and agriculture. SolarSPELL libraries are rugged and ultra-portable, so they can go anywhere and reach anyone, even the most remote.

Since 2015, SolarSPELL has implemented nearly 600 libraries in 15 countries, training more than 900 in-field trainers to reach an estimated 300,000 learners around the world. Of all users surveyed, 100% have reported that the SolarSPELL library has helped them do their jobs more effectively. For more information, visit solarspell.org.

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