Quadracci SUSTAINABLE ENGINEERING LAB.

COLUMBIA | ENGINEERING
The Fu Foundation School of Engineering and Applied Science

THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

SharedSolar - a qSEL project
Pay-as-you-go system for household electric

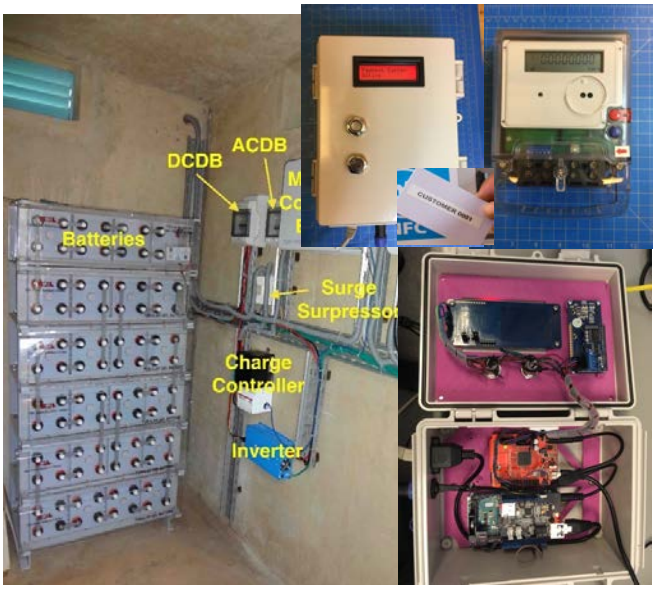
SharedSolar pioneered the first pay-as-you-go minigrids in Sub-Saharan Africa to provide grid-like service using renewable energy, digital metering and smartly managed storage. Shared Solar has brought reliable and verifiable electric service to off-grid communities. Core principle was to allow a seamless growth of consumption and appliance ownership on consumer side without having to make additional consumer investments each time in generation/storage hardware. Shared Solar takes a decentralized approach to providing electric infrastructure and service to communities that are not immediately considered viable for grid connectivity.

Flexible Payments, Reliable Service

Shared Solar is providing pay-as-you-go electricity to achieve maximum financial and social inclusion. Customers pre-pay for the service when they want, in amounts of their choosing and there are no fixed monthly fees. Energy service providers are encouraged to keep first costs to a minimum and try to spread those first costs over time. Real-time demand/supply management strategies help ensure low maintenance, fair distribution, high uptimes.

Incremental, Source-Neutral, Long-Term Infrastructure

The generation and storage capacities are sized to match existing and near-term demand. As the demand grows over time, capacity can be added, keeping the investments low in the beginning. Additional investments are then made as the system demand picks up. When the grid arrives, the local distribution network and management system can be utilized without modifications. Thus the grid can be an opportunity and not a threat to the operator. We started with first generation lab-built meters and Android and mobile money payment replaced with second-gen meters (see insets- left column). With continued cost reductions, the third-generation meters (see inset below), concentrator, controller and payment system for vendors/customers (see inset below) will be $35/customer at volume.



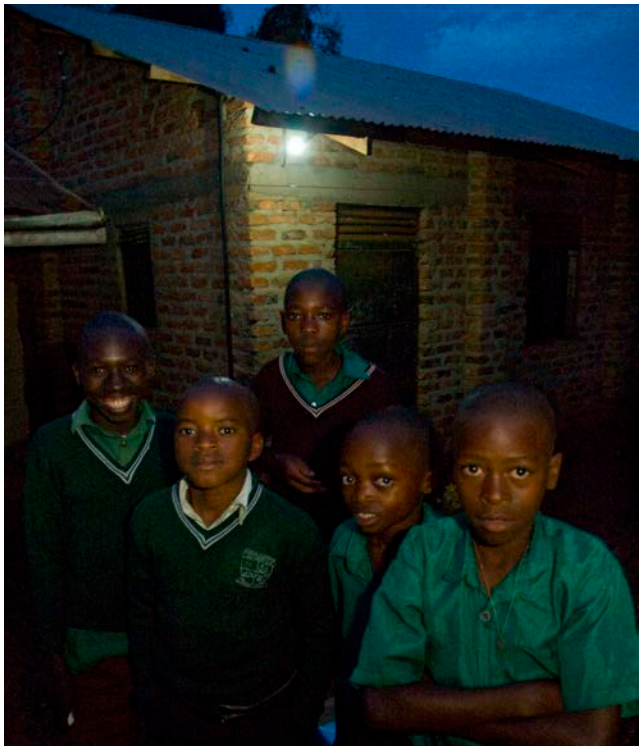
Data-driven Service Delivery and Contracts

All stakeholders have access to real-time, contextual information. Customers can access their use and balance data, make payments, etc. using mobile phones or through a local console. Operators have enhanced situational awareness and control, allowing them to manage their assets and operations effectively. Donors and governmental agencies can monitor performance using the same platforms.

How It Works

Agents make payments at Shared Solar offices and receive energy credits on their authorized mobile devices

or NFC Cards for distribution in their service area. Local Vendors then purchase credits from Agents. Customers make payments to Vendors, who then apply the energy credits to their accounts. Mobile banking integration and internet payments are all possible. Transactions can occur either using NFC cards, or be done wirelessly.



User Convenience

Shared Solar helps create a grid-like (230V AC) connection even for the poorest so that they can flexibly use electrical lighting, cell-phone charging, tablet/television, refrigeration, small pumps and other appliances even at low consumption levels. Smart, wireless metering eliminates transaction costs associated with small irregular payments that the low-income customers rely on. Appliance finance can be incorporated into the system as well. Health and safety problems from toxic fumes and poor quality lighting are eliminated. Clinics, schools and community centers, drinking water systems can all receive reliable power without burdening themselves with maintenance of separate stand-alone systems. Tariff-enabled financing permits leasing-to-own models for efficient appliances without additional costs of microfinance transactions.

Economic & Employment

Income-generating activities like agriculture, entertainment, ice-making, tourism etc can be powered sustainably. Systems can be upgraded when demands grow, ensuring precious capital is used judiciously while at the same time allowing customers and local entrepreneurs to grow their demands as they need without having to upgrade their individual systems.

Achievements and Success Stories

A group of women in Mali have started a cold-drink/ cold-storage business by leasing a ice-making system that they pay off through their electricity tariff. In Uganda, small businesses around battery charging, cold drinks and internet use have been facilitated.

What we can offer

We have learnt through nearly 6 years of experience and data analytics in Mali (8 sites near Segou) and Uganda (8 sites near Mbarara), how best to assess, design, install and operate/maintain such systems and we welcome opportunities for research, training, collaboration and technology transfer. Our knowledge base extends from costing, GIS, wired/wireless metering, tariff structures, demand, supply as well as battery management analytics.

Please contact John Peacock (at jhp30@columbia.edu) to request an appointment and to be placed on our mailing list. Updates are also posted at qsel.columbia.edu, of the Quadracci Sustainable Engineering Laboratory (qSEL) (formerly sel.columbia.edu) established through a generous gift from the Windhover Foundation. qSEL is directed by Prof. Vijay Modi (modi@columbia.edu) of the Department of Mechanical Engineering in SEAS.