Application specific microgrids: The case for photovoltaics+battery based cooking

Mahesh P. Bhave, Professor, NTPC School of Business, Noida, India

In parts of India, networked solar-powered irrigation water pumps are deployed as community microgrids, each pump set has a SIM card for integrating it with the surrounding wireless network. This may be described as Irrigation as a Service (IaaS). Lumens as a Service (LaaS) is already written about in RMI research, that is, community microgrids focused on lighting. Similarly, we propose Cooking as a Service (CaaS) or cooking microgrids.

All three examples involve focusing on the application, and not on electricity per se. That is, we parse the electricity supply and direct it to a particular use. In doing so, we eliminate the need to measure electricity in kWh, or as a flow, and instead emphasize the use of electricity - illumination delivered, or liters of water pumped, or meals cooked for a family of five per day. We could equally measure "cooling" or "motion" - rotary or linear - delivered, independent of the kWh consumption measure.

In apartment buildings, we can have electricity-based cooking isolated from the rest of electricity supply, and powered by a system of solar photovoltaics and batteries.

In un-electrified villages in emerging economies, typical applications emphasized include lighting, fans, phone charging, and TV, but seldom cooking. Even when cooking is addressed, the focus is on clean-burning cookstoves, ventilation, health benefits from avoiding smoke inhalation, labor savings from avoiding fire-wood collection, the use of superior bio-fuels, and so forth. This is understandable - cooking is a high power demand application, requiring at least a 1 kW cookstove. Delivering such power is expensive; the rural poor may not afford it.

We argue that clusters of homes in rural, emerging economies may be economically served by cooking-centric community microgrids. The falling prices of batteries, solar panels, and related hardware makes this a preferred solution because, should the cooking demand be economically met, the other electricity applications may be delivered at incremental costs. We anticipate the aggregate economics and non-tangible benefits would be superior to those offered by the traditional grid, and even standalone microgrids. Cooking, the most demanding application, should be the center-piece of electrification and welfare strategy.

We are designing cooking-centric microgrids for apartments, row houses, university dorms, restaurants, buffets, live food counters, and home clusters in villages. We have already deployed standalone prototype cooking systems using photovoltaics and batteries in USA and India. Economics requires cooking systems deployed at scale; the business model is based on vertical integration with virtual and physical clusters and sophisticated IT systems.