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Energy storage is important to tap renewable energy in an efficient manner because of the intermittent nature of renewable energy sources. This report examines the available storage technologies in India and discusses challenges faced while moving towards more efficient technologies. Further, it identifies points of engagements for the Renewable Energy Working Group (REWG) as a forum to collectively push for innovations in the policy framework for off-grid renewable energy.

It is expected that by 2020, off-grid renewable energy market will make up 1/3rd of the market potential for energy storage systems in renewable energy applications in India. Currently, off-grid entrepreneurs are faced with storage choices that are largely driven by cost. The report also discusses potential points of intervention that may help establish environment friendly and cost-effective energy storage systems for off-grid entrepreneurs.

Challenges such as short life and heavy weight of battery storage solutions, may be overcome if technologies such as nickel batteries, lithium-ion, lithium air, fuel cells, etc. become commercially viable.

This report provides an overview of the Indian energy storage market for off-grid solar, examines multiple storage technologies under development, and assesses opportunities arising due to the rapid adoption of off-grid renewable energy. It also highlights key challenges for battery manufacturers such as high technology costs, and uncertainty around performance in Indian climatic conditions.

Energy storage technologies provide flexibility in the use of electricity, for both centralised and decentralised supply provisions. Conventional use of storage systems by way of batteries (in electronic goods, vehicles) and accumulators (inverters and other electricity backup solutions) have been driven by commercial and technological considerations (and requirements), with little policy directive to incentivise the use of these novel solutions.

About 300 million Indians currently live off-grid, mostly in rural areas. Most are farmers who make around $4 a day in household income and often struggle to pursue productive, income-generating activities because of unstable power supply. This is an especially acute problem in eastern India, in states like Jharkhand and Odisha.

"We didn"t want to go in with a hypothesis on what the solution to this problem should be, but really to try to understand the most pressing problems facing rural Indian communities," Savla said in an interview with the Harvard Technology Review. "And so we went on a year and a half-long journey into just understanding the market."

Savla and Mehta spent all of their breaks going to India and conducting field interviews in dozens of villages

across multiple states, reading academic research papers, and talking to policymakers and other practitioners in the space.

The initial solution the duo came up with was Solara, a tool intended to make irrigation more affordable using solar energy. Solar can be 70% cheaper than diesel, which is what most of these off-grid farms are using in India, so the government has taken major strides subsidizing and really trying to promote adoption of solar power.

"We didn"t want to rely on any brand subsidy or impose a large upfront cost on farmers, so we settled on a pay per use model," Savla said. "We take a fixed asset and we spread out the cost across the community by sharing that asset. This way, we can bring down something that traditionally has a 10- to 20-year payback cycle down to a less-than-two-year cycle."

Savla and Mehta took their idea to all major startup competitions at Harvard -- the New Venture Competition, the President’s Innovation Challenge, and the Mittal Institute’s Seed for Change -- and placed first at all of these. Savla also was named a Cheng Fellow with Harvard Kennedy School"s Social Innovation and Change Initiative for Solara.

It was at the implementation stage, though, that the team gained a crucial insight. After designing and building portable solar irrigation kits, they tested them in the market, where they found that the product had to be more affordable and that weather-based variability made it difficult to have predictable irrigation sessions and for farmers to effectively use the kits so they could have a successful harvest.