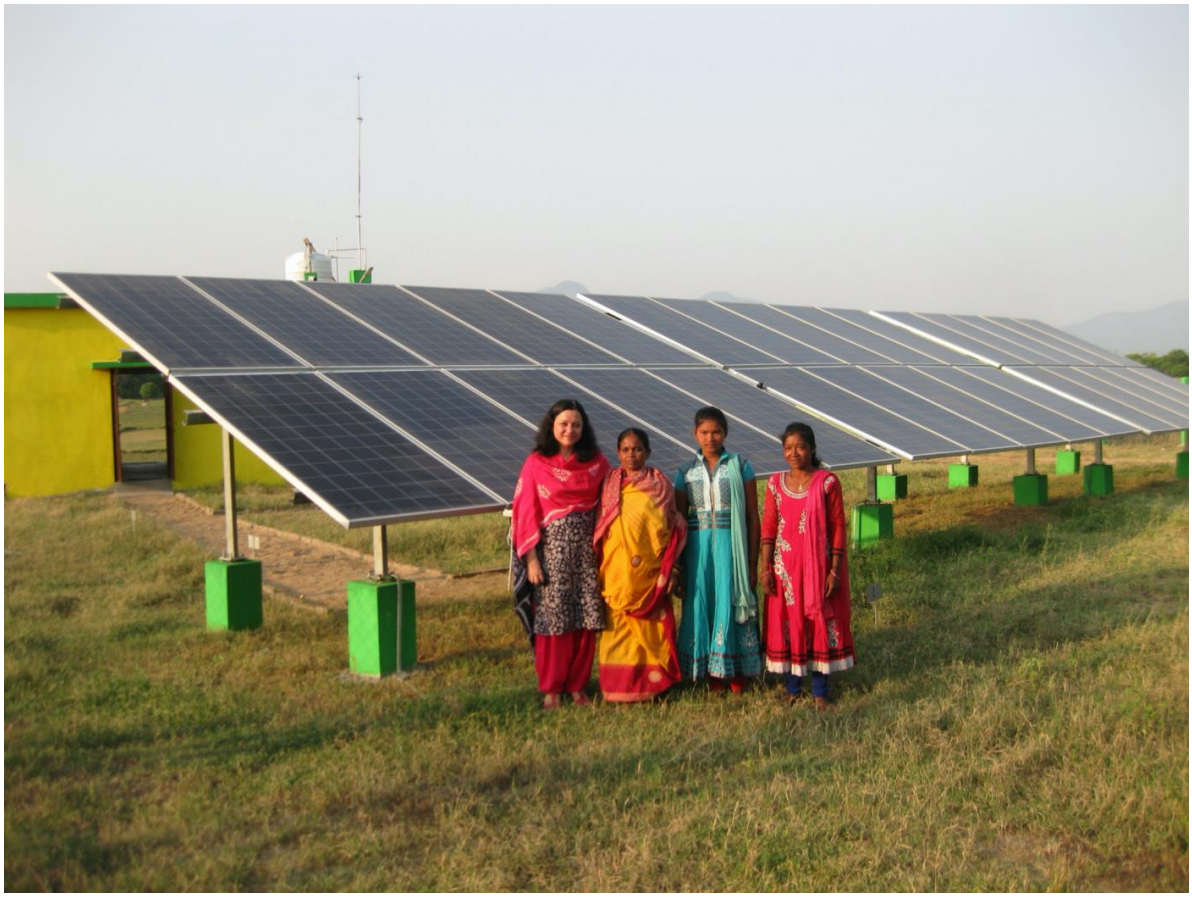
Kudagaon Pilot: Beating the odds

In this final article of the 'Powering Ahead' series, we talk about the gruelling challenges of executing the Kudagaon *Pilot, and how we got the better of them.*

By Vishu Mishra.

The Center for Study of Science, Technology and Policy (CSTEP) implemented the mini-grid pilot project during 2018–19 in *Kudagaon*, an un-electrified remote island on the Mahanadi River, in the Angul district of Odisha, where three generations of indigenous people live.

Though the project eventually became a successful example of the 'Build, Own, Operate, and Maintain' or BOOM model, it had its share of problems. The project team grappled with a slew of tricky issues that were unique to the project site.

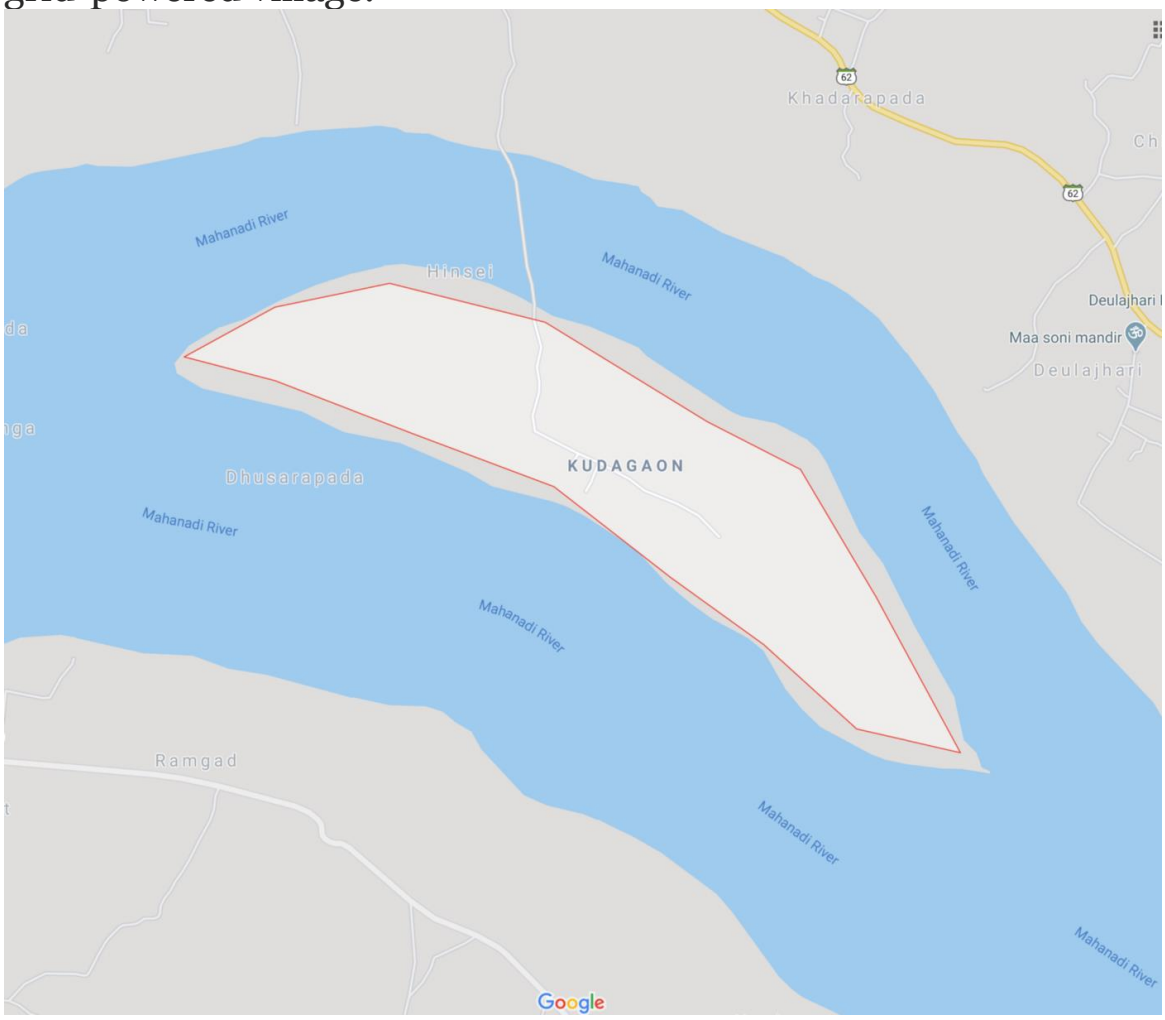


To begin with, most states did not have a mini-grid policy in place and so there was no clarity on the listed off-grid villages. Herein, *Sunmoksha* — the project partner — was instrumental in providing the relevant local information, along with support from Odisha Renewable Energy Development Agency (OREDA), which helped us seal *Kudagaon* Village as the final site.

The project site required the convergence of the three main collaborators or project groups — CSTEP, *Sunmoksha*, and the funding organisation Good Energies. Previous site explorations helped us narrow down the most essential requirements — an off-grid site with good solar irradiance, acceptance of a green plant by power users, local government support, and the clear absence of competition from a conventional grid.

Building a sustainable project

The natural location of *Kudagaon* took care of two sustainability issues. The central grid's expansion to the island village was extremely improbable, as the cost of infrastructural expansion was much more than the possible revenue from the village. Therefore, there was no threat from the main grid. Secondly, *Kudagaon*, being an island village, was unlikely to be affected by two different prices of sale of electricity — something that has been observed in other cases where a mini-grid-powered village is adjacent to a central-grid-powered village.



Even with such favourable factors, the project group took specific measures to build the sustenance of the plant, leaving nothing to chance. The distribution network was designed to be at par with the conventional grid infrastructure, and the solar-PV plant could operate in power transaction mode. This ensured that the mini-grid plant won't be endangered if the conventional grid ever takes over. In such a case the existing distribution network could be utilised to supply electricity to homes, while the mini-grid's flexibility would allow it to be operated in support roles, such as for supplying power only to anchor loads — agricultural pumps, rice mills, and other commercial loads.

Cutting through longstanding challenges

While the remote nature of the site solved an array of issues, it also opened up a few. During our earlier explorations, we had found several suitable sites which were rejected either due to the impact of floods on the area, or the need to cut down the thick vegetation there. In the latter case, it was not only against CSTEP's environmental policy but also seemed ironical to cut down green areas in pursuit of green electricity. In case of natural impediments such as floods, the *Kudagaon* island too gets cut off from the nearby Athamallik town when the Mahanadi River swells up in monsoon. This happened during the project implementation period.

The makeshift road to the village eroded away in floods, causing considerable delays that affected the execution timelines. The project group improvised and worked parallelly in small groups, gradually working on-site logistics.

We also encountered the issue of a shrinking population in *Kudagaon*. Consequently, a power system that was planned for 85 households, had to start with only 59 households. People moved out to the neighbouring town of Athamallik which offered reliable electricity supply and year-round work opportunities. These were not available in *Kudagaon*, where agriculture was practiced with primitive tools and only one rainfed crop was produced in a year. Villagers also did not see an electrified future for *Kudagaon*.

To resolve this issue, several individual meetings and group discussions were held. The narrative slowly converged on the opportunities associated with solar-generated electricity. The project group discussed the possibility of expanding irrigation capabilities and multi-crop farming round the year, enabled by borewells and lift irrigation from river beds. The electrification plan also talked about the improvement in quality of life post sunset, with streetlights, LED home lighting, and community centre lighting. Further, the project could meet some of the entrepreneurial aspirations of villagers such as opening *kirana* shops, and boosted the local economy via agriculture and food-processing value chains. The construction of the solar plant created an environment of trust towards modern energy sources, which was evident in the reverse migration of families to *Kudagaon*.

Tackling affordability-related issues

The most important part of addressing affordability concerns is countering the perceptions of a ‘freebie’. In many earlier explorations, our project group had come across mini-grids that

were funded under corporate social responsibility (CSR) and had no revenue matching model. It had also been observed in a lot of ground surveys that villagers are not comfortable paying money in exchange for electricity. Therefore, the first step towards changing this perception was creating a sense of democratic ownership. From the very beginning, the project group conveyed to the villagers that the mini-grid will be a demonstration of the 'Build, Own, Operate, Maintain' model, where the implementing partner will help in commissioning the project, but the ownership and management of day-to-day matters of operation and maintenance will lie with the village group. A solar energy committee was formed with an authority on billing, collections, and plant operations. The assets and responsibilities were transferred to the villagers after pilot installation.

During the course of construction, the *Kudagaon* residents were trained to handle the operations and maintenance of the plant. This helped in bringing down daily operational costs, preventative maintenance, and other costs incurred due to small system breakdowns.

Once the ownership and maintenance of the plant were secured, discussions on the cost of power were easier to float.
The *Kudagaon* survey revealed that villagers used 100–125 INR worth of kerosene per month. The project group decided to replace the use of kerosene and provide green electricity as a service in the

same cost bracket. Initially, it started out by providing two light points and a mobile charging point. Eventually, the added value of the local power plant was realised with community lighting, and provisions for agricultural use and commercial projects. The results of the 'Quality of Life' survey showed significant improvements, along with active involvement of villagers in the understanding of electronics and their consumption.

Other challenges and resolution

A lot of off-grid challenges were addressed by the design and technical solutions provided by *Sunmoksha*. For example, underground armoured power cables were laid which prevented power theft. Also, Smart Nanogrid™ — a feeder level management software devised by the company as a mini-grid solution — helped with regular and remote monitoring of the connected users. It has also enabled efficient utilisation of plant capacity, scheduling and delivery of power, transparent digitised billing and collections on phones, leading to overall effective administration of the consumer segment.

Overall, the *Kudagaon* mini-grid pilot provides a lot of small learnings for remote electrification endeavours. In our three-year journey through the project, we gained valuable insights for successfully replicating similar collaborative efforts towards improving the reliability of power supply and the quality of life of people in remote areas.