

Micro-hydro Power in Udmaroo village

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Udmaroo is powered by electricity, generated from the power of the moving water. Besides electricity, the power unit has provided income opportunities for the villagers and reduced the drudgery for women. The system, owned and operated entirely by the people has helped the village to become more self reliant.



Udmaroo is a bright green triangle in the sloping mountains, cultivating forty-seven of its 457 hectares through carefully channelled waterways. The main income of the village is subsistence agriculture: wheat, barley, mustard and vegetables, plus such an abundance of apricots in the summer that the fruits lie loose in the sea buckthorn hedges. There are no cars, and often no sound to hear but the running of the streams. The only other employment in the valley is through the army - Udmaroo is close to the Pakistan border, and army presence in the area is long established - or in coveted but rare government jobs. The young are now beginning to move out of the villages, looking for non-farming jobs in Leh and beyond.

To date, extending the main electricity grid to a place this remote has not been feasible, and the darkness that extends over the mountains at night can be absolute. Options then are weak and smoky kerosene lamps or diesel generator sets. Udmaroo had a small diesel generator, a gift from the army, but in 2005 the people of the village approached LEDeG (Ladakh Ecological Development Group) looking for a more accomplished solution. The organization assessed the need in the village, and the feasibility of various types of renewable energy. By 2008, a 32kVA microhydro power unit was installed in a glacier stream above the village. Now, for nine months of the year, Udmaroo is lit and powered by electricity, generated from the power of the moving water. The system is owned and operated entirely by the people who live here.

Every one of the ninety houses in Udmaroo has an electricity connection from the micro-hydro power unit, through a miniature grid that spans the village. Electricity could be transmitted all day - for as long as the energy from water is available - but the village has decided to only transmit to domestic users after dark, from around 6pm to midnight. The monthly fee of Rs. 90 for this service is ostensibly for use of five CFLs (compact fluorescent lamps use less energy than incandescent bulbs), but in reality there are no restrictions on the amount or type of appliances people use. Households use mixers and irons, or even electric butter churners for making the high fat, salty butter tea that people in Ladakh drink to stay warm during the bitter winters. Radios, tape recorders and televisions have also been enthusiastically welcomed to the village.

Power generates income

In addition to comforts, the power unit has also provided seasonal income opportunities for the villagers. Rigzen is a member of a women's group that has purchased a 7.5kW oil extraction machine, and now makes a small income pressing oil from other villagers' mustard seeds and apricot kernels.

The small, localised nature of this power generation has the advantage that it can be tailored to customers' needs, and the group were able to arrange for a special cable to be strung from the power unit to the shed where they house the machine. They pay Rs. 15 per hour for daytime electricity, and charge Rs. 80 an hour for their services.

Profits are stored in a common bank account, and excess oil is packaged in old half-litre rum bottles, and sold to the army for Rs. 300 each. At the feet of their red machine, bright yellow mustard plants have sprung up from stray seeds.

"It's important for us to be able to earn," says Rigzen, 44. Women always work in villages, but in domestic and agricultural settings their labour is often not rewarded financially. Their business has made a pleasant change. "When we collect the money we feel we have an investment somewhere, and we feel motivated to do more work." The women of the group are mostly not educated, and have little experience outside of Nubra Valley. The money they're earning means they could change this, if they wished. "If we're able to generate enough income, one of our dreams is to visit places outside Ladakh," says Rigzen.

With power comes responsibility

Every customer in Udmaroo is a member of an electricity management committee or EMC, though the social and technical governance of the system is the responsibility of an elected body of six villagers. LEDeG is not part of the committee, acting only as a facilitator. Electricity fees are collected by the committee's cashier and stored in a common bank account. Apart from the yearly purchase of five kilos of grease to slick the machine, the only regular running costs are Rs. 3,000 a month for the operator's salary, which allows the committee to collect savings of Rs. 5,000 or more per month.

As with most renewable energy technologies, high installation costs are balanced by little to no generation costs. Any post-installation costs that do arise are paid for by the committee's saved revenue. The elected committee donate about a week of their time every month, free of charge. Most are army retirees, whose previous career gave them an exposure and an education that has come in useful in governing the project.

"Having the micro-hydro power unit (MHPU) has reduced our drudgery a lot," says Tashi Namgial, the secretary of the committee. Before the installation, villagers would have to travel to powered towns nearby for services that required energy, such as oil extraction or fruit processing. The power unit has helped the village to become more self reliant: in addition to the oil extraction machine, a men's carpentry group says they have doubled their income since buying a machine to carve doors and window frames for Udmaroo. Another women's group has bought a pulping machine, producing 1,500 bottles of apricot jam for sale over the last two years.

Even with the electric irons, the mixers and the microindustries, Udmaroo still only uses around seventy per cent of the unit's 32kVA capacity. Unlike solar photovoltaic, adding capacity to an installed micro-hydro can be difficult, hence the size of the unit was chosen to be excessive to the village's immediate needs. Yet when nearby villages - without electricity - approached Udmaroo's management committee and asked if they would consider selling some of their excess, the men declined. "There would be extra maintenance costs, and we think it's safer to keep it for ourselves," says Lobzanj Tsephel, the president of the EMC. "With the current demand, even as the amount of houses grow we see we'll have enough capacity for the next fifteen years."

The reticence to share may be explained by the efforts the villagers put into the set up of the power unit. Firstly, those who were pro installation had to persuade others. "Initially there was a lot of resistance," recounts Lobzanj. "Only fifteen households wanted to do it." "People weren't confident that it would be successful," explains Tashi. "And that meant they weren't willing to contribute their money or labour to set it up." Between LEDeG and the eager families, the hesitant ones were convinced, and a site high up in the cliff was identified.

The villager who owned the land agreed to sell it for the project for Rs. 60,000. Each household then contributed Rs. 1000 – no small amount for a village in which the average income is between Rs. 10,000 to Rs. 30,000 a year. The power unit cost Rs. 220,000 to set up in total, of which money and time contributed by the villagers covered nearly forty-eight per cent. The remaining funds were sourced by LEDeG, as grants from European bodies.

A distribution grid was made with poles of the willow that grows fast in the region, and wires strung by men balancing precariously on beams and ladders. A section of the stream also had to be diverted to run through the MHPU, a "really tough job," says one villager. "The pipes were so heavy, and we nearly gave up." All the villagers, both men and women, put in about two months of labour to install the system.

Figuring out the small print

More than two years after installation, it's interesting to hear the finer details of how the community have adapted to governing their own electricity system. Mutup Tashi is the operator: he mans the micro-hydro power unit on the mountainside above the village, turns its switches and cleans silt from its crevices. The committee manages any problems itself, save one, when the previous operator left the machine running and a part had to be replaced. The equipment had to be ordered from Nepal, and took eight months to arrive.

Mutup has been trained by Lobzanj and Tashi, and has a handbook in the local Bodhi language. Someone has strung ribbons across the ceiling, but he says it can get a little lonely up on the hill on his own. However, Mutup is one of the few in the village who considers he is given enough respect for his job. The elected members feel overlooked. "People aren't supportive of what we're doing!" complains Tashi. "They don't realise how much time and effort we have to put in." He says family members tease them that it's not a 'proper job,' unlike paid employment in the army or government.

There's no question that they may leave their positions, though. "We've been trained over and over again [by LEDeG]," he says. "So we feel obliged to take care of the project." There's a discernible amount of pride in his voice as he continues: "We also realise that if other people in the village manage it they won't do it well enough. We've worked hard to get to this point, and don't mind continuing." While the EMC may grumble that the villagers do not respect them, they receive no opposition to their work: the bill payment rates in Udmaroo are a remarkable one hundred per cent.

Such honest commitment to the system seems to stem from a couple of factors. Firstly, Ladakhi communities are recognised as closeknit and peaceful. The living conditions in the Himalayas are known to be some of the harshest on earth, and people are used to pulling together to make it through the merciless winters. The EMC has no standard procedure for complaints, as the community is so close they are dealt with on a personal basis. Three widows are given electricity for free, as the community knows they have little source of income. This village has no crime, and doors are never locked.

"I think projects like this help bring a community closer together," says Tseway Motup, Rigzen's husband. "We're happy with the way the operator works, but if there's a problem that's beyond him we all go up and help." The second factor is that the villagers are well aware how enviable their situation is. The rivers and streams freeze in Nubra Valley for up to four months each year, and the micro-hydro power unit does not create electricity then. So from December to March, the EMC runs a small diesel generator set instead, distributing electricity through the same micro-grid. This provides a direct comparison to the alternative energy paradigm for the villagers. The costs for diesel are much higher: in the winter of 2009-2010 each household has to contribute Rs. 600 for one month of electricity, as opposed to the Rs. 90 they pay for the microhydro. By using the micro-hydro for nine months of the year, the village saves at least Rs. 120,000, compared to what they would spend if using only diesel.

"We do think about pollution, too," says Lobzanj. "In the months we have to use the diesel it creates a lot of smoke." It's the first mention of pollution in this story of renewable energy: while mitigation of pollution and climate change are motives for renewable energy in the wider world, here they make sense for developmental reasons alone. There are government plans afoot to build two 1-2MW dams on the Shyok River, ostensibly to bring electricity to clusters of villages similar to Udmaroo. This would create no thick smoke, and the villagers would not have to manage the system themselves. Would Udmaroo want it?

Surprisingly, most people say no. "Since we've invested so much time and effort, I'd be happy continuing with our own system," says Rigzen. "But if there are problems [with the grid], it's the government's responsibility," counters her husband. "But it's our own source of power and we have control over it," points out Rigzen. "Whenever we have an occasion like a marriage or death, we can ask that the electricity comes to power it. With the grid, we have no control." The members of the EMC – the people who voluntarily give their time to managing the micro-hydro – agree with Rigzen. "If the grid comes, we'll still maintain the microhydro, as we have control over it," says Tashi. "Plus we would have to pay more for the grid. "Electricity is such an important part of our lives, it's good to be in charge."

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