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Benjamin Linder - (Barus Awardee 1988)

Description

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Body

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Author(s): Stephen Unger

VIOLENCE VERSUS APPROPRIATE TECHNOLOGY--THE BEN LINDER STORY

As a boy growing up in San Francisco and then Portland, Oregon, Benjamin E. Linder was always tinkering with tools and mechanical gadgets. An excellent student, his mechanical bent led him to enroll in the Mechanical Engineering Department of the

University of Washington. From the outset, he intended to apply his engineering skills to help better the lives of poor people in underdeveloped countries. This idea was furthered in a course he took entitled "Appropriate Technology", taught by Professor Philip Bereano. The goal in this course was to show how the needs of people in relatively primitive environments can be met by the application of technology intelligently adapted to their human and material resources. Among the concepts considered when Linder took the course was that of small scale hydroelectric plants.

A Need--Electric Power in the Mountains

Ben spent the summer of 1982 in Nicaragua, and decided that this would be a good place to put his skills to work. After graduating in 1983, he headed for Nicaragua to work as a volunteer under the sponsorship of the Nicaraguan Appropriate Technology Project (NICAT). After working for a public utility in the capitol city, Managua, he became involved in a small scale power project in a mountainous area of Northern Nicaragua in the Spring of 1984. This was the kind of work he really wanted to do. Plunging in with great enthusiasm, he soon became the lead engineer.

The region in which Linder's project lay is known as Cuá-Bocay. It is covered with mountains and forests, with many rivers and streams. The great bulk of the population (perhaps 33,000) consisted of small farmers living and working without benefit of modern technology. Access to the outside world was via dirt roads. Medical facilities were minimal. Electric power in the region was available only from a few small diesel powered electric generators that were often inoperative due to malfunctions or lack of fuel (which was trucked in irregularly).

Lacking a reliable electricity supply, there were no machine shops, no refrigerators, no electric lighting. The consequences of the absence of refrigeration go well beyond the unpleasantness of warm beer. Modern medical practice requires a variety of products that must be refrigerated. Vaccination programs, for example, are heavily dependent on refrigeration. Without machine tools, the repair of even simple farm implements becomes difficult if not impossible. Evening classes to raise the educational level of local farmers are not feasible without electric lights.

An Appropriate Solution

Meeting the need for electricity via a large scale hydroelectric project, for example,

could not even be considered for this sparsely populated, impoverished area of a poor country. However, the prevalence of running water is a rich resource that can be tapped, in an incremental fashion, with only a modest investment of materials and skilled human effort. A project to accomplish this and several associated objectives was initiated by the Nicaraguan government in conjunction with various international volunteer groups, such as NICAT (based in Bellingham, Washington). It was called the Cuá-Bocay Integrated Development Project. A first step was to be the construction of a small hydroelectric unit 5 km from the center of the hamlet of El Cuá. Ben Linder cut his engineering teeth on this enterprise, which had been languishing since 1980.

The technical difficulties were substantial. The 25 year old engineer was inexperienced and there was little opportunity to consult with more knowledgeable people. In this isolated community of 1500, even the simplest tools and materials were often unavailable. It was a three hour jeep ride over 70 km of rough dirt road to the nearest city, Matagalpa, a metropolis with 30,000 inhabitants. From there to Managua was another 6 hour drive. There was no regular delivery service. Minimal funds were available.

Skilled mechanics were not to be found. In fact, few in the area were familiar with the use of even the simplest tools. An important objective of the project was to teach the local people the skills necessary in the construction, operation, and maintenance of the system. The idea was to put them in position to build additional plants themselves and gradually to master the skills needed to develop other technological facilities to improve their lives.

An American-made 100KW generator was purchased with funds donated by the UN. A 1929 vintage governor came from Sweden. Linder designed a simple turbine, which was then built to his specifications in Nicaragua. At the selected site, the stream was, in Linder's language, "two sidewalks wide and a foot deep". The vertical drop from the dam to the turbine was 50 yards. The turbine and generator together were smaller than a desk. At every step in the construction process, Linder involved local people. He taught them how to work with concrete, how to use wrenches, grease bearings, and so forth. This was not classroom type instruction, but hands-on learning. He would typically begin an operation, and then, under his supervision, one or two trainees would continue it. For example, if the installation of a part entailed required the use of four bolts, Ben would put in two and then watch his pupils put in the other two. As people became more skilled, they would help

others to get started. By the time the El Cuá plant was completed, there were several peasants from the area fully capable of operating and maintaining it and many others had acquired various new skills.

A Lot of Work--But also Some Play

A member of a family that was often involved in liberal causes such as anti-war activities and the civil rights movement, Ben Linder had a strong social conscience. This was coupled with a lighter side. He had a good sense of humor and a wide range of interests, including music, chess, and dancing. He was a member of a not-very-successful high school swimming team. One of his more unusual hobbies was clowning. In line with his generally fun loving nature, Ben learned to juggle, ride a unicycle, and walk a tight rope. He once rode his unicycle from the Canadian border all the way to Santa Barbara, California.

In addition to the long hours he spent working on the hydro project, which included a lot of traveling to and from the site, Ben found time to exercise some of his other talents. He occasionally donned his clown suit and delighted crowds of children with his juggling and unicycle performances. Sometimes the performances were meshed with public health campaigns dealing with issues such as inoculations against measles. More often it was just a matter of having fun.

Next Steps

The El Cuá hydro plant went into operation in May, 1986. It was used, as planned, to power a small machine shop, including welding apparatus, support a medical center (with a refrigerator), and, after dark, to illuminate a classroom for an evening school. Future plans for the project included the construction of a saw mill so that the local people would be able to make boards for building construction out of local timber, which was abundant. Associated with this would be a carpentry shop and facilities to make cement blocks, bricks, and roof tiles for local use. The value of small hydro plants, and the feasibility of constructing them in the region was now established. Linder felt that he had learned a great deal during this initial phase and would be able to put this knowledge to good use. He was slowed down somewhat by a bout of hepatitis, and later by a leg infection, but was eager to begin work on the next hydro plant.

This was to be located about a mile outside San José de Bocay, in the Northern part

of the Cuá-Bocay region . In the Spring of 1987, Ben began the preliminary work of measuring rainfall, and estimating flow-rates at the site during wet and dry seasons. But he never completed the job.

A Different Kind of Obstacle

The difficulties discussed above pertained to physical factors and the impoverished condition of the people. But there was another obstacle of a rather different nature. All during the 80's, a guerrilla army, known as the contras, supported by the US government, fought against the Nicaraguan Sandinista government. One of their principal tactics was to attack farmers, teachers, technicians, physicians and the like in the countryside in an attempt to weaken the government economically. They killed hundreds of Nicaraguan professionals and at least seven European volunteer workers. The contras were active in the Cuá-Bocay region, where they constituted a serious problem for Linder and those he worked with. In fact one reason that the El Cuá development project was at a near standstill when Linder began work on it was the reluctance of Nicaraguan engineers to venture into the region for fear of being killed. In 1985, two nurses from the El Cuá health center were killed by contras. The El Cuá power plant was attacked, but successfully defended by local people. Army patrols and armed militia defended the area, but working there was still risky.

Linder was of course well aware of this situation. When an organization of American citizens living in Nicaragua filed a lawsuit to stop US aid to the contras in September, 1986, he contributed a supporting affidavit. In it he stated that he believed his life was in danger as a consequence of this aid. The suit was unsuccessful. But he felt too committed to the work he was doing to back off.

On April 28, 1987, Ben, two assistants and an escort of four armed militia men went to the San José de Bocay dam site to continue making rainfall and flow rate measurements. Shortly after their arrival, a contra unit attacked them from ambush with hand grenades and automatic rifles. One of the assistants, one of the militia men, and Ben Linder were killed.

Aftermath

The family, colleagues, and friends of Ben were grief stricken and outraged by his violent death. He was a man who inspired great affection and respect among those who came in contact with him. Although the probable objective of his killers was to

discourage others from doing the kind of work that Ben did, the actual effect seems to have been the reverse. MIT graduate Rebecca Leaf took over as lead engineer and other associates of Ben, including Mira Brown, and Don Macleay played key roles in continuing the work. The Ben Linder Memorial Fund was organized by his family to help finance the Cuá- Bocay project.

By the end of 1992, the El Cuá generator was still operating successfully, powering a well equipped machine shop, among other things. The shop has proved to be an immensely valuable asset to the people in the area. It is used to make simple parts for the repair of tools, trucks, farm equipment and the like. The San José de Bocay plant, with more than twice the capacity of the El Cuá facility, was expected to go on line in 1993. It will be named after Ben Linder. Many of the parts for its turbine were made in the El Cuá machine shop. Other projects that the same group have completed in the area include a gravity-fed potable water system, a small facility for making rammed earth bricks, and the installation of an electric corn mill. Many local people have received practical training and operate the power plant and other facilities. There are also ongoing projects related to agriculture and to the environment: for example efforts to prevent deforestation that would adversely affect the watersheds of the streams that power the turbines.

The next small hydro plant is expected to be constructed in Pita del Carmen, a community near El Cuá. It is interesting that the population of this area consists largely of ex-contras. Furthermore, a number of ex-contras are included in the work force completing the Benjamin Linder plant. Nevertheless, the situation is still an uneasy one, with occasional outbreaks of violence still occurring.

In 1988, the IEEE SSIT Award for Outstanding Service in the Public Interest was posthumously awarded to Benjamin Linder in recognition of his "courageous and altruistic efforts to create human good by applying his technical abilities".

This story is an excerpt from:

Unger, Stephen. Controlling Technology: Ethics and the Responsible Engineer. 2nd Ed., Wiley, 1994. Chapter 2 Section 8.

Contributor(s)

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