Purpose

Joy of Living and Sustainability

Aaron Crenshaw | Class of 2014
Mechanical Engineering

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Grand Challenge Project – CSP PTC System for communities in Uganda
Interdisciplinary Experience – Thermodynamics, design, economics, power conversion and storage, systems
Entrepreneurial Experience – Social entrepreneurship
Global Awareness – Uganda
Service Learning – Helping hospitals and schools

The first twenty-five years or so of the modern successful American life has been fairly well defined by the country's education system. Go to primary school. Get good grades. Go to college. Get good grades. Graduate with a degree in something you love. Find a good job. Make money.

As a child, I was well-aware of this system. From an early age I fully intended to go to college and major in something lucrative, my thinking shaped by years of advice from parents who managed start-ups, real estate, and stocks. Well before high school I began searching for a dream, trying to decide what I should spend the rest of my life doing. I was smart. I was good at math and science. I was also good at art, theater, writing, philosophy, and other subjects that would leave me with a job that wouldn't make the expense of college worthwhile. I also enjoyed playing Roller Coaster Tycoon. So I decided to become an engineer. Since I also grew up constantly being reminded about the virtues of running your own business, I also decided to go someplace where I could study business and entrepreneurship. This ultimately led me to Franklin W. Olin College of Engineering, a new engineering school near Boston that was on a mission to integrate entrepreneurial thought and action throughout its curriculum.

So I came to Olin equipped with my plan. Get an engineering degree. Invent something. Start a business. Make bank. And after planning out my four years of classes, crafting my major concentration in entrepreneurship, taking Olin's Foundations of Entrepreneurship course, and starting my own business over a summer, I came to realize something.

I just wasn't as enthusiastic about business as I was hoping I would be. I was frustrated with the predatory mentality I was seeing among other entrepreneurs. I realized that bootstrapping was not all it was cracked up to be. At the same time, I was beginning to worry, because I couldn't find a topic in engineering that I enjoyed and that I was good at. So when I enrolled in my Thermodynamics course, I was fairly dejected.

It was in my Thermodynamics course that I began focusing on energy. It was the first engineering course that I took that I felt competent in, and I found the subject matter fascinating, especially subject matter on power plants.

When I left my Thermodynamics class, I latched on to energy as a sort of pseudo-concentration in my major. I presented a project I worked on in the class at an ASME conference. I became a course assistant for the course. And I decided to enroll in a new course being offered at Olin, "Design of Energy Systems," where I began learning about energy generation in the developing world and the operation of microgrids. I crafted a reputation for myself – I was the student interested in thermodynamics and energy.

Perhaps energy was something I latched on to because it was something I was "good" at, but I think there was another element at play – my frustrations with entrepreneurship and business. That frustration extended into engineering as well. I myself developing a distaste, perhaps even a disgust, for expensive engineering projects that poured resources into making the lives of the well-off better when those same resources could be spent impacting so many other lives in a more important way. Energy, in comparison to other engineering topics, felt more "real." Having access to a stable grid measurably improves people's

lives. Energy helps move the world. Yet it's a double-edged sword – if mismanaged, it could also destroy the same world it's being used to move. The energy industry seemed to be a great place to place my focus if I wanted my education to make a significant impact on humanity. So when I was approached at the start of my senior year to become involved in a project developing miniature power blocks for small institutions in Uganda, I was more than ready to join.

The goal of the project was to design a parabolic trough collector (PTC) concentrating solar power (CSP) block that could be entirely manufactured by workers in Uganda for minimal cost to supplement power being provided by the local grid. The national power grid in Uganda is wildly unstable, resulting in frequent power outages that interfere in the operations of schools and hospitals. In the latter example, the loss of power can lead to loss of life.

There is, of course, little that can be done by a small team of engineering students with regards to the national power grid. However, by applying our understanding of microgrid infrastructure, we could take a different approach to helping schools and hospitals with their energy problems. We didn't need to create a system that would take these institutions off the national grid. Rather, we needed to generate a system that could provide enough power from a separate source that the statistical chances of a total power outage could be significantly reduced and allow the institutions to continue their essential operations until the power from the national grid was restored.

PTC CSP systems operate by reflecting sunlight using parabolic mirrors on to a pipe with a fluid flowing through it. With the heat input, the fluid is pressurized. That fluid is pumped to a turbine, where it is given the chance to depressurize by performing mechanical work by spinning the turbine. This allows us to effectively convert the heat of the sun into electrical energy.

While working on this project, we chose to take a fundamentally different approach than other, similar projects would. Oftentimes the mentality of the American scientific community is to design a system in America, test it in America, and then ship it off to the community in need. While providing a sustainable system in this manner is a step in the right direction toward empowering these communities, it is not far enough. We wanted to come up with a design that could be manufactured, in its entirety, in Uganda, by Ugandans. To take it a step further, we decided that the testing of the full-scale system should primarily be performed in Uganda by the community members we were working with.

In a way, this project represents the shift in my thinking during my time at Olin. What really excited me about this project was that it was "real" – I was performing real engineering analysis for a real social entrepreneurial project that would improve the lives of real people. I came into Olin seeing engineering and entrepreneurship as occupations, where the salary is a means by which I may sustain my lifestyle outside of my work. I am leaving Olin seeing engineering and entrepreneurship as a means by which I can improve lives, where the salary is a means by which I may sustain myself while performing my work.