My desire to pursue a PhD in Power Engineering has been an unusual journey. Let me tell you my story.

By the time I was eight, I had lived in four different countries (Uruguay, United States, Mexico, and Spain) and was completely fluent in both Spanish and English. I had seen how big the world was and lived in a variety of cultures and lifestyles that most people do not get to experience in a lifetime. I understood the world was bigger than my small bubble, and that not everyone came from the same walk of life with the same opportunities.

I always loved solving problems and knowing how things worked. In sixth grade I tried to join the Math club, because I wanted to do more math problems after school. Unfortunately, my teacher informed me that the club was for students struggling with math and needed extra tutoring. The following year the school offered advanced math courses, and these became my foundation for learning how to study and work hard at concepts that were difficult to understand.

I enrolled at the University of Pittsburgh because I wanted to be close to my family and the Swanson School of Engineering had a good reputation. I was drawn to physics, but also to the unlimited applications of computers, so I decided on Electrical Engineering. I wanted to focus on hardware because it seemed to be the perfect mix of physical constraints and limitless possibilities of coding. Pursuing this interest, I worked in the Cooperative Engineering Program at Bridge Fusion Systems LLC (BFS), a tiny electrical engineering consulting company that specialized in hardware projects. As only the third employee at the company, I eagerly started working on meaningful hardware projects. My first project was to design code and tinker with a small test fixture to swiftly load and calibrate microcontrollers that were going to be used for wi-fi compatible Smart Plugs. At the end of my rotation I installed the test fixture at a manufacturing company. These smart plugs are now being installed in two Pittsburgh buildings and could save the city $6.3 million in energy costs over the next 10 years[1]. Learning how to begin, develop, debug, and complete professional projects was an invaluable skill that I was able to apply to school and undergraduate research.

To apply what I had learned at BFS towards sustainability I volunteered my time to improve and advance projects in a Sustainable Design lab at Pitt. I joined a small team of undergraduate students working on building low-cost microcontroller-based air quality sensors. My teammate’s backgrounds with microcontrollers were limited and the circuits being built for the sensors were difficult to debug and tedious to build, so they were struggling to move their project along. I was able to quickly identify problems with the circuits but ultimately recommended changing the implementation of the project because of the lack of resiliency in the microcontrollers they were using. Another team in this lab was testing how ultraviolet LEDs could be used to decontaminate water. But their circuit design and implementation prevented the LEDs from being operable, so I redesigned their code and adjusted their circuitry so they could control and record the intensity of the light. Working in this lab allowed me to collaborate with engineers outside of my field of study and provided the opportunity to apply my skills to benefit sustainable projects.

To widen my scope of understanding, take advantage of opportunities available at a research driven university, and use my engineering skills to benefit the environment I contacted Dr. Thomas McDermott because he was leading research projects focused on sustainability. The project I began with Dr. McDermott would last over three summers and was my introduction to the field of Electric Power. The goal was to develop a process to quickly convert Duquesne Light Company’s (DLC), the local electric utility in Pittsburgh, distribution circuit maps into testable models. In 2015 DLC was beginning to see interest for distributed photovoltaic (PV) generation or solar panels on customer’s homes. The traditional techniques used by DLC to analyze their circuits were not sophisticated enough to study the impact distributed PV would have on their circuits and thus forcing DLC to limit the PV penetration to a 15% threshold. The models I was designing would allow for individualized analysis to adjust the PV threshold for each circuit. models.

After two summers of designing the process to build circuit models the project was still incomplete but I was determined to apply my models to increase the PV penetration in Pittsburgh, so I pursued an internship at DLC. As an intern I was able to enhance the model building process but more importantly I designed studies to assess the impact PV had on a circuit. Using the PV Integration Handbook (source) and DLC safety thresholds as my main guides, I designed a voltage study and a fault study that could be conducted on the circuit models. I chose two circuits to study, one had DLC’s largest customer owned PV installation, and the other had the highest number of PV installations. I tested the circuits without PV (to provide a baseline), with the current PV installations, and with excess PV. I was able to conclude that both circuits had little or no safety concerns in their current state and could handle much more PV at specific locations. Since this was the first study of its kind at DLC and my method of building circuit models uniquely did not require any Geographic Information System, we decided to publish a conference paper at the 2018 IEEE Power and Energy Society general meeting on the project, where I was the primary author.

During the middle of my 3rd year in college, I promised my grandmother that I would move to Phoenix the fall after my graduation because she had been diagnosed with Alzheimer’s and was aging quickly. At the time moving across the country to help my aunt care for my grandmother seemed like a big promise to make but I knew it was the right thing to do. Not only would this give my grandmother something to look forward to, but I would add some stability where the family needed it the most.

Though my post-graduation destination was set, I did not have a clear direction I wanted to take my career. My passions became cemented a couple months before I moved to Phoenix during a three-day backpacking trip in the Rocky Mountains. Nearing the completion of the hike, I climbed up to a vantage point and was completely isolated. I could not believe the beauty and the grace of my surroundings but could not shake the dreadful thought that climate change and pollution would destroy this breathtaking landscape in only 20 years. In that moment I concluded my career must be dedicated toward preserving our planet and I could maximize my role in the global quest to combat climate change by working with renewable energy in the power sector.

This decision was heavily influenced from the challenges that DLC (and other utilities) faced integrating PV into their electric grid. Even though I was leaving Pittsburgh at the end of the summer my project had gained some traction at DLC, which led to a job offer as the first and only remote employee at the company. This position allowed me to broaden my knowledge and understand the limitations of an industry that is at the beginning of substantial change. Though I have seen a future where I work at DLC for my entire career, I want to use my knowledge and talents to positively impact a greater scope of humanity, and solve problems that all utilities are facing, rather than just one.

Therefore, I am anxious to begin working with Dr. Yang Weng, so I can leverage his expertise in Machine Learning to use cutting edge techniques for solving the problems utilities are currently facing. My graduate research will focus on breaking down the barriers that are preventing small scale PV and customer owned energy storage systems from being widely distributed and accepted. I believe customer owned energy storage systems are going to be integral for integrating distributed renewable generation and Machine Learning techniques will be required to operate this data driven system. I cannot wait to begin applying my knowledge acquired at DLC so my research benefits both the utilities and their customers.

Recently, I have begun tutoring my younger cousin with his high school math homework. He has a lot of potential but is a typical teenager who struggles to care about anything other than video games and football. During our tutoring time I try to impart some of my young wisdom and life advice. By building a bond with him I hope to nudge him in the direction of enjoying school, building empathy, and fulfilling his dreams of going to a prestigious college. Though I’ve spent most of my college and post-college career working on projects, this has given me the opportunity to work on a person. So far being a positive influence on my cousin has been incredibly rewarding because I have found I can improve people, and not just things. Not only has this ignited my eagerness to help future students as a teaching assistant, but I have begun to pursue STEM outreach opportunities through ASU to mentor the upcoming generation of engineers.

Through tutoring my cousin, mentoring my teammates on the Pitt Ultimate Frisbee team, and helping my friends and classmates with homework, I have found that I can be a patient and helpful teacher. To leverage this talent and give back to the Ultimate Frisbee community, I will be volunteering as the assistant coach of the ASU ultimate frisbee team for the upcoming season. My decision to play Ultimate Frisbee was lifechanging and awarded me opportunities I could never have dreamed of. I played on a professional team, won a college national championship, caught a world championship winning goal for the Under-24 Men’s National team, and used my voice and platform to advocate for gender equity. I owe it to the community that gave me so much to give back and I am looking forward to being inspired by a younger generation of players.

The graduate research fellowship program will give me the resources to continue my quest to provide clean renewable energy to everyone. As a PhD student at ASU I will continue to use my privilege and resources to give back and wholeheartedly commit to becoming an expert on distributed renewable energy generation and control. I am leaving my comfortable and rewarding job at DLC so I can continue to challenge myself and have my work lead to a cleaner more sustainable planet.

Trib source (<https://triblive.com/local/allegheny/14020300-74/city-planning-to-use-smart-plugs-and-magic-boxes-for-high-tech>)