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 don’t 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.

Entering high school, I selected the pre-engineering program to learn about different engineering disciplines. In groups of three or four we completed a wide variety of projects. My favorite project was building toy bridges out of balsa wood to test how much weight different designs could carry. We also learned simple circuitry in a robotics class, learned how to draw in CAD, and designed a 3D printed toy telephone.

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. I was the third employee at the company and I eagerly started working on meaningful hardware projects. My first project was to design a code and tinker with a small test fixture to quickly load and calibrate microcontrollers that were going to be used for wi-fi compatible Smart Plugs. 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 (trib source). Learning how to begin, develop, debug, and complete professional projects was an invaluable skill that I was able to apply to school and 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 adjust 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 how I could 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 undergraduate 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 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 so DLC was limiting 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 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 a lot more PV at specific customer locations. Since my method of building circuit models uniquely did not require any Geographic Information System data and my findings were relevant, 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.

Before joining DLC I decided I was going to move to Phoenix, Arizona to live with my grandmother because she had been diagnosed with Alzheimer’s and was aging quickly. My Aunt, who was her primary caregiver, was also running a business and raising her teenage son and I knew I was the only one in the family that would be able to offer any support. I had been in Pittsburgh over half my life and I knew that I had to venture away because I feared getting stuck in my comfort zone. At the time, I was still unsure of where I wanted to take my career but on top of helping my grandmother, Phoenix had a lot to offer in terms of job and schooling opportunities.

While preparing to move to Phoenix I had a few phone interviews with hardware and software companies in Phoenix, but the products they produced were for larger companies, and I could not see myself becoming passionate about this type of work. My passions were cemented when I went on a three-day backpacking trip with my father 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 that by working with renewable energy in the power sector, I could maximize my abilities to combat climate change.

Even though I was now working in my career field, I remained fully committed to moving to staying in Arizona to fulfill the promise I had made to my grandmother two years prior. Fortunately, my project had gained some traction at DLC and begun to produce results which led to a job offer from DLC, as the first and only remote employee at the company. As a remote employee, I have continued to create circuit models that DLC engineers can use to study our system, and I have broadened my knowledge of an industry that is at the beginning of substantial change. Though I can see 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, whose expertise in Machine Learning will allow me to use cutting edge techniques to solve problems utilities are currently facing. I am presently studying how to break down the barriers that are preventing small scale PV and personal energy storage from being widely distributed and accepted. I want my research to benefit 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 am able 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 and rekindled my passion to make people, and not just things, better. I am excited to bring this passion towards helping my future students as a teaching assistant during my graduate studies. I have also

I believe my story shows that the obvious next step in my career is to attain a PhD. My track record of completing meaningful projects, giving back to my family, and my dedication to sustainable solutions epitomize all the characteristics of a Graduate Research Fellow. Thank you for your consideration.

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