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 electronics, so I decided on Electrical Engineering. I wanted to focus on hardware because it seemed to be the perfect mix of physical constraints and possibilities of coding.

After my second year of college I pursued a summer internship at a Pennatronics, a high quality circuit board manufacturing company. It opened my eyes to how circuits were produced, but the bottom line was making money and I felt like the technicians at the company were compensated unfairly [what is point of this?]. In order to get more work experience I decided to choose the Cooperative Engineering Program, and obtained a position at Bridge Fusion Systems (BFS), a tiny electrical engineering consulting company that was able to complete projects at low cost and outside the scope of companies that hired them. Since I was the third employee at the company, I had to pull my weight and worked on meaningful projects. I built test fixtures, designed circuit boards, programmed microcontrollers and learned multiple coding languages. Learning how to start, develop, debug, and complete multiple professional projects was an invaluable experience. Still, the end product was just supporting larger companies, and though the work was fun, there was not much focus on giving back ???.

I decided I wanted to try my hand at undergraduate research. I reached out to Dr. Thomas McDermott, and was sponsored by the SSOE undergraduate research internship program for the summer of 2015. This was my introduction to the field of Electric Power. That summer, I started what would become a three summer project. The goal was to develop a process to convert Duquesne Light Company’s (DLC), the local electric utility in Pittsburgh, distribution circuit maps into models. That summer I spent learning the capabilities of AutoCAD and OpenDSS, an open source electric power distribution system simulator, and I was able to design process to build a single connected model. Though I had made a lot of progress, the project was incomplete and there would not be anyone to finish what I had started. So the following summer Dr. McDermott sponsored me as an undergraduate research assistant to improve my method, and by the end of the summer I was able to construct seven models.

Around this time I decided I wanted to move to Phoenix, Arizona to live closer to 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.

Entering my last year of undergrad at Pitt the research project was still incomplete so I decided I would pursue an internship at DLC the summer after I graduated. My goal was to finish the project at DLC and then move to Phoenix to begin my adult life. My project originated because distribution circuit models were the only way to adequately assess the impacts of photovoltaic generation (PV) on a system, so I developed and conducted studies on the circuit models I had built to assess the state of DLC’s two circuits that had the most PV penetration. I also have improved the process that I am able to generate a model in a few hours, compared to an entire summer. Since the method of building circuit models was unique and did not require any Geographic Information System data, 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.

While preparing to move to Phoenix, I was still struggling to decide what I wanted my future career to look like. 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, and in that moment I decided I needed to devote my career to make sure that what I was currently seeing, would be there when I came back in 20 years. While I was working at DLC I learned about many of the challenges utilities are facing integrating PV into electric grid. So I decided that I would devote my career to working within the power sector and solving the problems of integrating renewable energy into the current system.

Even though I was now working in my career field, I remained fully committed 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 beyond excited that I am beginning my graduate studies at ASU. Dr. Yang Weng’s 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.

To contribute to the broader impacts of science 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. I was able to redesign their code and adjust their circuitry so that 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 learned how engineers of all fields can combine their knowledge on the same project.

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 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 improve the world epitomize all the characteristics of a Graduate Research Fellow. Thank you for your consideration.