**EE 570 Renewable Distributed Generation & Storage:**

As a requirement for my degree and due to its alignment with my field of energy engineering, I participated in Dr. Kevin Burke's "Renewable Distributed Generation & Storage" course. This course provided an extensive study of Distributed Energy Resources (DERs), Distributed Generation (DG), Distributed Energy Storage (DS), microgrids, and associated technologies. The course was crafted to cater to my career goals in the renewable energy sector, offering a balanced blend of theoretical knowledge and hands-on application.

The curriculum was thoughtfully designed to keep us informed about the latest technological advancements, operations of microgrids, benefits of DER-based microgrids, power flow analysis, islanded mode operation of EPS, and the technical challenges associated with design and acceptance. It also emphasized the availability of cost-effective technologies for the installation and utilization of microgrids. The course structure included unique homework assignments, in-class exercises, a mid-semester examination, individual presentations, and a culminating project, all of which facilitated a deep understanding of various problem statements and the development of solutions using the PowerWorld Simulator.

For our final project, we undertook the "Design Project: System Planning/Conversion," which involved transforming an existing non-islanded grid section into a fully functional Microgrid System capable of operating in islanded mode. The project focused on renewable distributed generation and storage at the University at Buffalo (**Figure 1**). It involved analyzing various aspects such as electricity demand, peak demand, load shapes, generation and storage capacities, environmental impacts, efficiencies, and control devices.

Our aim was to optimize power generation and distribution on campus. This included the installation of a Solar Array and natural gas generators to meet peak demand. Various parameters like generation capacities, load duration curves, and simulation results were considered for efficient electricity management. The project deepened our understanding of microgrid capabilities, including load characterization, UB's current energy profile, and the intricacies of microgrid design. This encompassed charging station expansions, DER and DS, solar array sizing, battery and inverter sizing, wind turbine sizing, storage capacities, and underground transmission cable sizing. We also conducted simulations with proposed SLD, one-line diagrams using ETAP, and utilized software like MATLAB (**Figure 2**).

Dr. Burke's teaching approach was interactive and engaging, fostering a dialogue between him and the students. Each session commenced with a discussion on current events and policy changes in renewable energy, enabling us to comprehend their implications, advantages, and disadvantages from an engineer's viewpoint. The course offered a comprehensive perspective on the evolution of power and energy, encompassing historical inventions, technological advancements, and the impact of policies, world leaders, and conventions. This holistic approach not only facilitated my understanding of significant historical events that have shaped the current energy revolution in the United States but also kept me abreast of ongoing industry developments and future prospects. I would strongly recommend this course to students with an interest in microgrids and those aspiring to join the utility industry.

A diagram of a computer

Description automatically generatedA map of a city

Description automatically generatedFigure1: Location of UB substation

Figure2: Simulink Model of a Microgrid