SECURE for Student Success

Undergraduate Research Program

Department of Electrical and Computer Engineering

Research Duration: Summer 2024 (June – August 2024)

Faculty: Rasoul Narimani

Email address: Rasoul.narimani@csun.edu

Contact No: Office: JD 4435
Telephone Number: 818-677-7254
Office Hours Mondays & Wednesday 11:00 am-12:00 pm

Title of Project:

Investigating the impact of Electric Vehicles on Power Distribution Systems

Goals and Objectives of the Project, Expectations and Outcomes

The overarching goal of the project is to investigate the impact of Electric Vehicles (EVs) on Power Distribution Systems. This research endeavor aims to provide undergraduate students with a comprehensive understanding of the interplay between electric vehicles and distribution networks. The specific objectives are as follows:

Understanding Electric Vehicle Modeling:

Develop a comprehensive understanding of the principles and techniques involved in modeling Electric Vehicles within power distribution systems. This encompasses learning how to compute or estimate the power drawn by electric vehicles from the grid.

Proficiency in PowerWorld Software:

Gain hands-on experience with industrial software, particularly PowerWorld, to model and simulate electric distribution systems. This experience is highly impactful for students as it equips them with the skills to effectively work with industrial software, enhancing their employability prospects in the power system sector later on.

Integration of Electric Vehicles into Distribution Systems:

Apply the acquired knowledge to model the integration of Electric Vehicles into existing distribution networks, considering factors such as charging infrastructure and load variations.

This includes understanding the electric fleet power and learning about different charger types and their corresponding electric load drawn from the grid.

Impact Assessment:

Investigate and analyze the impact of Electric Vehicles on distribution system parameters, including voltage profiles, power losses, line congestion, and reliability metrics. This is crucial, as the electric grid is not fully prepared for the extensive deployment of electric vehicles, and their connection in large numbers simultaneously can lead to unexpected consequences on the electric grid. This incurs a significant load on the system and may result in outages.

Recommendations for System Enhancement:

Under the guidance of their advisor, students will acquire the knowledge and skills necessary to propose recommendations and suggest potential system enhancements. This collaborative learning approach will empower students to navigate the complexities of mitigating challenges and optimizing the integration of Electric Vehicles into power distribution networks. With the support and mentorship of their advisor, students will gain valuable insights and practical experience, fostering a deeper understanding of the technical, economic, and environmental aspects involved in this critical aspect of modern power systems.

Report and Publication

In the first summer, students will learn how to write scientific reports, improving their communication skills. If they continue working on the project the next summer, they can expand their findings. The best part? Their work might get published in conferences like TPEC, PECI, or the NAPS, giving them a chance to share their research with a wider audience.

Describe briefly what students can expect to learn by participating in this project.

Throughout the summer research program, participants are anticipated to achieve a spectrum of outcomes that align with the project's overarching goals. Students will cultivate technical proficiency by mastering the intricacies of modeling Electric Vehicles and distribution systems using PowerWorld software. Analytical skills will be honed through the evaluation of the impact of Electric Vehicles on power distribution system performance, with a focus on factors such as voltage profiles, power losses, line congestion, and reliability metrics. Furthermore, participants will develop problem-solving capabilities, addressing challenges associated with the integration of Electric Vehicles, including load balancing and grid stability. Research and documentation skills will be refined as students prepare a report documenting the project's methodologies, findings, and recommendations. The opportunity to present their work will enhance communication skills, providing a platform to deliver a clear and concise overview of the project to peers and mentors. Ultimately, participants will gain a holistic understanding of the role of Electric Vehicles in the context of sustainable energy practices and their implications for modern power distribution systems. This research experience aims to empower students with the knowledge and skills necessary for contributing to the evolving landscape of electric transportation and its impact on energy infrastructure.