



Company Information

Company Name	<i>Duke Energy</i>	Date Submitted	<i>04/30/2025</i>
Project Title	<i>Design of an Animal Mitigation Solution for Substations (DUKE_ANIMAL)</i>	Planned Starting Semester	<i>Fall 2026</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	6	Electrical	
Computer		Systems	

Company and Project Overview:

Duke Energy is one of the largest electric power holding companies in the United States, providing electricity to 7.6 million retail customers in six states. Duke Energy has approximately 49,500 megawatts of electric generating capacity in six states in the Carolinas, the Midwest and Florida.

Animal related outages are a common cause of reliability problems for electrical utility customers. Snakes pose a particular problem because of their ability to climb substation structures to reach bird nests. When the snake contacts energized components a flash occurs, protection operates, and equipment damage can occur. The incident often requires a technician to be dispatched to the station and causes several hours of customer outage. Current animal mitigation solutions include a perimeter fence with proprietary animal guard features which are very effective but can cost more than \$1 million per substation to install. The high cost of this solution prevents installation at all 5,400 substations in the Duke system. A more cost-effective and scalable solution would allow broader adoption by the company and could prevent thousands of customer outage minutes.

Project Requirements:

The animal mitigation solution should create an animal guard around the legs of substation structures, preventing a snake or other animal from climbing up the leg. The solution should be modular to allow installation on different sized legs on both lattice and tubular steel structures. The solution can include both metallic and non-metallic components, but any metal must attach securely to the substation steel to provide electrical continuity to the station ground. The solution must be durable, resist moisture and UV exposure, and have an expected life of 25 years. The solution must also be installable using common hand tools. Student team should brainstorm broadly for different types of solutions and design and develop 3-4 different types of solutions to validate in field testing.



Tubular Steel Structure



Lattice Steel Structure



Expected Deliverables/Results:

- Prototype modular solutions that can be demonstrated to attach to various sizes and types of substation legs. Designs cannot violate any existing patents.
- Engineering drawings and material lists that will allow a Duke Energy contractor to fabricate the components on a scale to support widespread deployment.
- Material costs and labor estimates for both component fabrication and installation in a substation.
- Research and/or testing of the prototypes to provide evidence that the proposed solutions will be effective against animal encroachments.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. It is also a mandatory part of this Program that the industry supporters attend the 2 expos to grade their team's performance. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Interest in creative mechanical design
- Ability to fabricate team solutions using COE labs