Senior Design Project Description

Company Name	Schweitzer Engineering Laboratories	Date Submitted	April 28, 2017
Project Title	Schweitzer Engineering Laboratories Microgrid FEED Study, Design, and Simulation for UNC-C campus (SEL_MICRO)	Planned Semester	Fall 2017

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical		Electrical	3
Computer	1	Systems	
Other ( )			

Project Overview:

Current trends in the power and energy industry have propelled microgrids as a popular power system for critical institutions,such as college campuses, hospitals, and military bases. Microgrids contain local distributed energy resources (DERs) and is normally tied to the overall grid, but has the ability to disconnect from the overall grid and operate in an islanded mode. In addition to power system protection, SEL is a leader in microgrid controllers and services.

Initial Project Requirements:

 SEL desires to partner with University of North Carolina at Charlotte (UNCC) to propose a Senior Design project with the objective of designing, modeling, and testing a microgrid for the UNCC campus grid. The microgrid will consist of a photovoltaic array and backup diesel generators to provide local generation, disconnect switch and breaker that can connect/disconnect the campus grid to the utility grid, protective SEL relays to provide protection in utility-tied cases and islanded mode cases, and an SEL RTAC to provide microgrid control and monitoring.

Expected Deliverables/Results:

Project Objectives:
• Design the microgrid, including:
     o Appropriately sizing DERs
     o Placement of protective relays, instrument transformers, and other equipment with regards to the existing campus grid design
     o Develop control algorithms within the RTAC to properly transition from grid-tied mode to islanded mode and vice versa (use of synchrophasors, timing requirements, etc)

- Understand the technological and economic benefits of a microgrid
- Test various cases of the campus microgrid using RTDS
    - Test fault cases that will cause protective relays to operate
    - Test control cases, such as grid-connected to islanding transition, closing switches/breakers, turning on/off DERs.
- Demonstrate multidisciplinary cooperation between electrical and computer engineering students.
    - Interface the protection and control systems

Project Deliverables
- Microgrid Feasibility Report – details a high-level overview of the microgrid design requirements, sizing of DERs, protective relays required, control equipment required for a microgrid to be implemented on UNCC's campus grid.
- Design Drawings Package
    - AC one-line showing overall electrical system architecture, CT & PT placement, relay placement, breaker & disconnect switch placement, etc.
    - AC three-line showing detailed CT and PT connections to relay terminals.
    - DC schematics showing I/O assignments
    - Communications one-line diagram showing the overall communications architecture, including details of cable types used, port types, devices, etc.
- RSCAD Model File
    - RSCAD file of the finished microgrid model that will be tested in RTDS.
    - Model scope will either be a section of the UNCC campus grid (such as CRI campus), or aggregated sections of the entire campus grid, including points of interest to be studied.
- Relay Settings and RTAC Settings
    - Logic
    - Protective elements
    - Targets
    - Communications
- Testing Report
    - Report detailing results of tests of the protection and control systems.

Disposition of Deliverables at the End of the Project:

Deliver all documentation to Sponsor

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

The following would be helpful if available: AutoCAD, RTDS, RSCAD, SEL product knowledge, SEL RTAC programming