Senior Design Project Description

Company Name	*Schweitzer Engineering Laboratories*	Date Submitted	*November 16, 2018*
Project Title	*Microgrid – Optimized Resource Management and Coordination* **(SEL_MICRO2)**	**Planned Semester**	*Spring 2019*

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		Electrical	3
Computer	1	Systems	
Other ( )			

Company and Project Overview:

The previous SEL Senior Design project designed, modeled, and tested a microgrid for the UNCC campus grid. As a continuation of that project, the project team will design a control system for the purposes of managing and optimizing the use of the microgrid generation sources in a variety of system configurations. The generation sources involved in the microgrid will include the utility source, photovoltaic array, battery system, and a combined heat and power (CHP) plant that will be added to the current design. The microgrid resource management system will have to demonstrate an ability to supply the load at any given time under the following system configurations: grid-connected mode, islanded mode, and contingent modes that consider a single generation source out of service. If time permits, optional scope of this project will include a load shedding scheme to reduce the system load within the generation capacity at a given time.

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 resource management system for the UNCC campus grid. The microgrid resource management system will be modeled and tested in the Real-Time Digital Simulator (RTDS) with SEL relays in the loop. It should demonstrate an ability to supply the campus load under varying system conditions and to economically optimize the usage of the different generation resources.

Expected Deliverables/Results:

Project Objectives:
- Design the microgrid resource management system, including:
    - o Appropriately sizing the CHP plant to provide 50% of the base load
    - o Placement of protective relays, instrument transformers, and other equipment with regards to the existing campus grid design
    - o Develop control algorithms within the SEL relays to manage the generation resources based on

the various system configurations.

    o (Optional) Load shedding scheme to reduce the load to generation capacity under various system configurations.

- Understand the technological and economic benefits of a microgrid
- Test various cases of the campus microgrid using RTDS
    - o 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.
    - o Interface the protection and control systems Project Deliverables

Project Deliverables

- Functional Design Specification: details the operation of the microgrid resource management system and its requirements that must be met to optimize the economic operation of the system.
- Design Drawings Package
    - o AC one-line showing overall electrical system architecture, CT & PT placement, relay placement, breaker & disconnect switch placement, etc.
    - o AC three-line showing detailed CT and PT connections to relay terminals.
    - o DC schematics showing I/O assignments o Communications one-line diagram showing the overall communications architecture, including details of cable types used, port types, devices, etc.
- RSCAD Model File
    - o RSCAD file of the finished microgrid model that will be tested in RTDS.
    - o 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
    - o Logic
    - o Communications
- Testing Report
    - o 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