Senior Design Project Description

Company Name	CAPER	Date Submitted	June 5, 2017
Project Title	Microgrid Design for a Solar and Battery Energy Storage Facility (CAPER_BESS)	**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	4
Computer	1	Systems	
Other ( )			

Project Overview:

Given the load data, Cyme model and load type percentages of feeder X, design a Microgrid system containing BESS (500kW & 2MWh) and a 500kW solar facility. The microgrid load will have a peak kVA demand of 160kVA with a power factor of 90% (lagging) and will consume 552,000kwh annually. Develop and simulate control algorithms for islanding and grid-tie modes for the optimum use of the generation sources based on the value of excess energy (provided in the attachment). The microgrid must provide ample reserves for microgrid support in the event of a sustained utility feeder outage. Feeder reliability data will be provided. Develop protection requirements and specify protection equipment for the primary and secondary nodes during islanding mode.

Initial Project Requirements:

SCE&G to Provide:
- CYME circuit models of feeder
- Microgrid load profile data
- Microgrid single-line diagram
- Grid Interconnection protection settings

Expected Deliverables/Results:

First Semester Deliverables:

- Research various BES Management schemes for application in the microgrid: PV firming, energy time shift & peak demand reduction
- Complete review of available distribution BES chemistries and technologies and select optimal technology for price/performances (Examples include: flow battery, lithium ion, lead acid, etc.)
- Model selected BES and PV system in steady state software
- Incorporate BES management scheme into circuit simulation
- Design solar array using string 1000VDC inverter

Second Semester Deliverables:
- Evaluate the introduction of a super cap hybrid BESS
- Develop and simulate grid-ties and islanding control algorithms
- Evaluate performance of selected BES and management scheme for the microgrid
- Plot state-of-change of battery throughout the operating conditions.
- Plot output of solar along with microgrid consumption and excess energy dispatch and or storage

Disposition of Deliverables at the End of the Project:

Deliver to CAPER technical rep

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):
- Strong interest in the Power Generation field
- Background in control systems theory and power system protection would be preferred.
- Knowledge of Cyme Software
- Ability to travel to status meetings that will be held off-campus. Presence is required at ALL off-campus meetings