

Nanogrid to Campus Microgrid

Santa Fe Community College –
February 26, 2019

Academic and Workforce Development



- Siemens will offer to help with a Sustainability Education program which helps identify and fund customizable programming and awareness campaigns that create transparency and build consensus,
- Siemens Academic and Workforce Development programs represent a portfolio of cross-divisional and globally leading technology and expertise, packaged specifically for our higher education partners.
- This includes hardware, software, curriculum, instructor training, and certifications designed for hands-on learning to support technical workforce needs and employment in factory automation, industrial manufacturing, design engineering, building automation and more, all of which have the potential to further impact how Northeast Community College interacts with and helps support local industry

Siemens Microgrid Training Program

- The Siemens Microgrid Training Program (SMGTP) is based on Siemens industry-leading and utility-grade microgrid control technologies.
- Siemens provides hardware, software and training including our advanced Microgrid Management System (MGMS) for hands-on learning. A microgrid “living lab” can be designed to provide generation and grid design and simulation opportunities, including concept-based microgrid configurations.
- Students can learn the influence of energy demand, generation portfolio and availability (grid and DG sources), and transmission constraints on generator dispatch, electricity prices and system reliability.
- The microgrid training program can also enable the monitoring, simulation and analysis of actual campus energy system performance. This program was launched at the University of Central Florida in 2017.

SMGTP Academic Partnerships: University of Central Florida, Santa Fe Community College (in development) and Algonquin College (in development).

Siemens SMGTP: <https://w3.usa.siemens.com/smartgrid/us/en/microgrid/pages/microgrids.aspx>

Why Santa Fe Community College?



Motivated College Leadership

Supportive Community

**Tradition of Environmental
Protection**

SFCC Technology Center



Trades and Technology Center for Sustainable Education and Embedded Living Lab



Solar PV and Solar Thermal





Energy Partner Original Concepts

INDUSTRY PARTNER/ ADVISOR

- Difficult to reach the goal without prominent industry partnership
- Help Identify Achievable Goals

CARBON NEUTRALITY

- Incremental Distributed Energy Resources
- Peak Demand Reduction

MICROGRID

- Starting with a Nanogrid
- Ending with Campus-wide Microgrid

FACILITY OPTIMIZATION

- Bold Efficiency Measures such as Combined Lighting & HVAC Sensors
- Integrate Greenhouse, Biofuels, WWTP into Energy Strategy

Santa Fe Community College Overview

- Established in 1983, Santa Fe Community College has grown rapidly. Today, the college serves more than 13,000 students annually on a 366 acre campus. The building footprint is $\sim 700,000$ ft² Instructional and General. An original signatory to the President's Climate Change Initiative, SFCC policy is energy self-sufficiency and to become an energy island (microgrid). To date the infrastructure change has resulted in energy costs dropping from $\sim \$250/\text{FTE}$ to $\sim \$150/\text{FTE}$ in less than 10 years.
- In phase I, SFCC constructed an 11,264 ft² greenhouse and classroom to provide instruction in hydroponics, aquaponics, on-site energy production, microgrid controls, and building automation systems. It will operate on campus generated power and will be 100% off-grid ("nanogrid").
- Phase II will be to convert the entire campus into a microgrid.
- The microgrid will support educational, agricultural, commercial and industrial loads.
- SNL/DOE is partnering with SFCC and Siemens to develop and deploy energy storage (batteries) for both phases.



SFCC Microgrid Planning Concepts

- * Why invest in your public utility when you can invest in your institution or company with Microgrid technology for future energy needs”?
- * Smart microgrids using real-time data and performance to manage energy and resiliency.
- * Microgrid technology industry partners provide and allow new opportunities for training and research.

TATC LEED Platinum Facility

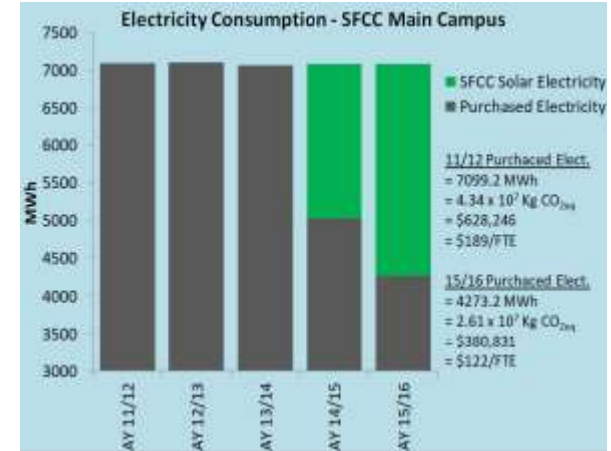


Greenhouse and Nanogrid



SFCC Energy Assets Planned for Microgrid and Resiliency

- A solar photovoltaic system - 4,620 SunPower 327W PV modules (1.5 MW)
- A solar thermal system - Thermal storage capacity -12,500 gal
- Natural gas generator
- Energy storage systems
- Energy recharging systems
- Bio-fuel generators
- Battery or battery packs



The energy assets will be assembled into a Microgrid controlled system provided by Siemens (MGMS) controller to serve as SFCC educational and functional distributed energy system Microgrid.

- Peak shaving, load smoothing, energy shifting
- Operational modes: Island or grid connected

An Overview of the Microgrid at Santa Fe Community College

Energy Assets

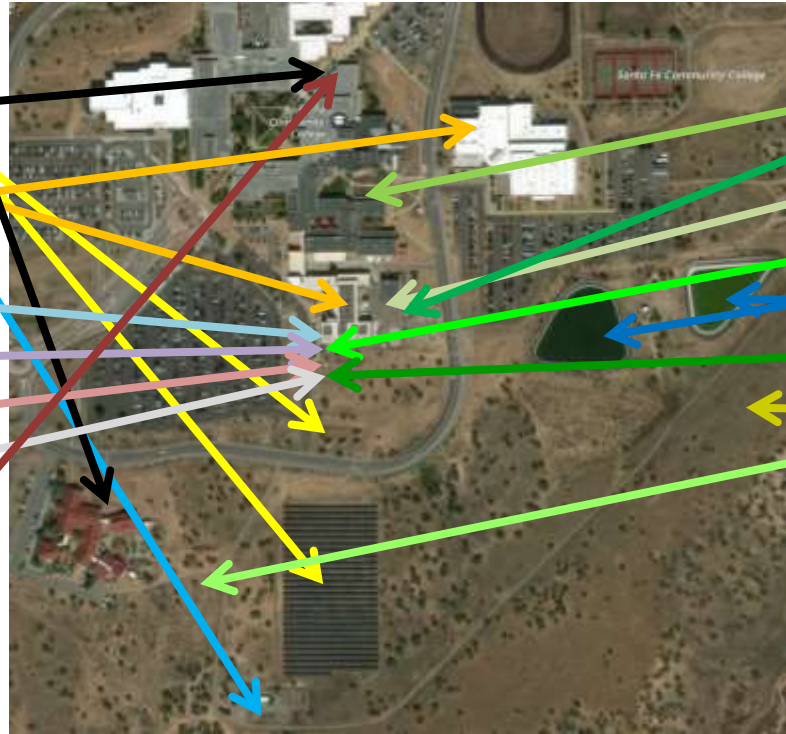
Biomass Boilers
 Solar PV
 Solar Thermal
 Anaerobic Digester Biogas
 Biodiesel
 Bioethanol
 MGMS controller
 Natural Gas

Planned/Future Assets

- Battery Storage
- Wind
- Expand Solar PV

Agriculture Assets

Culinary Garden
 Aquaponics Greenhouse
 Farmpod
 Algae Cultivation Testbed
 Reclaimed Water (3.4e6 gal)
 11,264 ft² Greenhouse
 Switchgrass (2 ac)
 Spirulina Microfarm



CampusEnergy 2019



Create The *Advanced* Building Automation Lab and Microgrid Curriculum

- * Living Laboratory * Curriculum * Building Automation Certification
- * Internships
- * Training Teachers * Site Visits to Siemens Installations





Microgrid Training Program at Santa Fe Community College

Certificate in Electrical, Smart Grid and Micro Grid Technologies

Feedback

Successful completion of this certificate prepares students to enter the transforming electrical power sector as a competent engineering technician. Students will gain a broad understanding of the dynamics of the changing electric sector, supported with hands-on learning experiences in the area of smart grid and micro grid design and management.

Learning Outcomes

Upon completion of this program, students will be able to:

- Evaluate and communicate design goals, constraints, and methodology within the engineering fields of discipline.
- Evaluate and solve engineering problems related to course content.
- Articulate and justify both technical considerations and solutions through oral, written and graphical communication methods in engineering problems.
- Effectively solve problems in teams.
- Demonstrate an understanding of professional and ethical responsibility in the field of engineering.

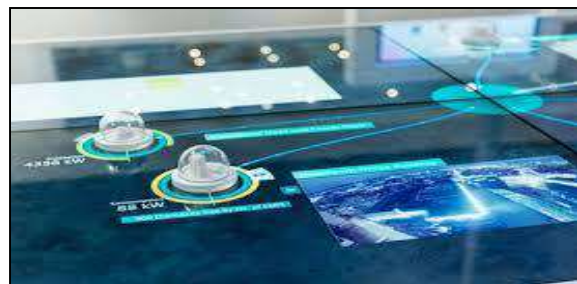
Class Requirements

CORE REQUIREMENTS: (22 Hours)

ALFT 111 Introduction to Alternate Fuels (3)
ELEC 111 Electronics Fundamentals (4)
ELEC 151 Power Generation, Transmission and Distribution (3)
ELEC 201 Smart Energy Management Systems (3)
ENGR 111 Intro to Engineering (3)
ENVR 113 Instrumentation and Controls (3)
SOLR 121 Design and installation of Photovoltaic Systems I (3)

NOTE: See First-Year Student Success Course Requirement on Page 8.

TOTAL 22 CREDITS



Q and A Campus Energy 2019



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