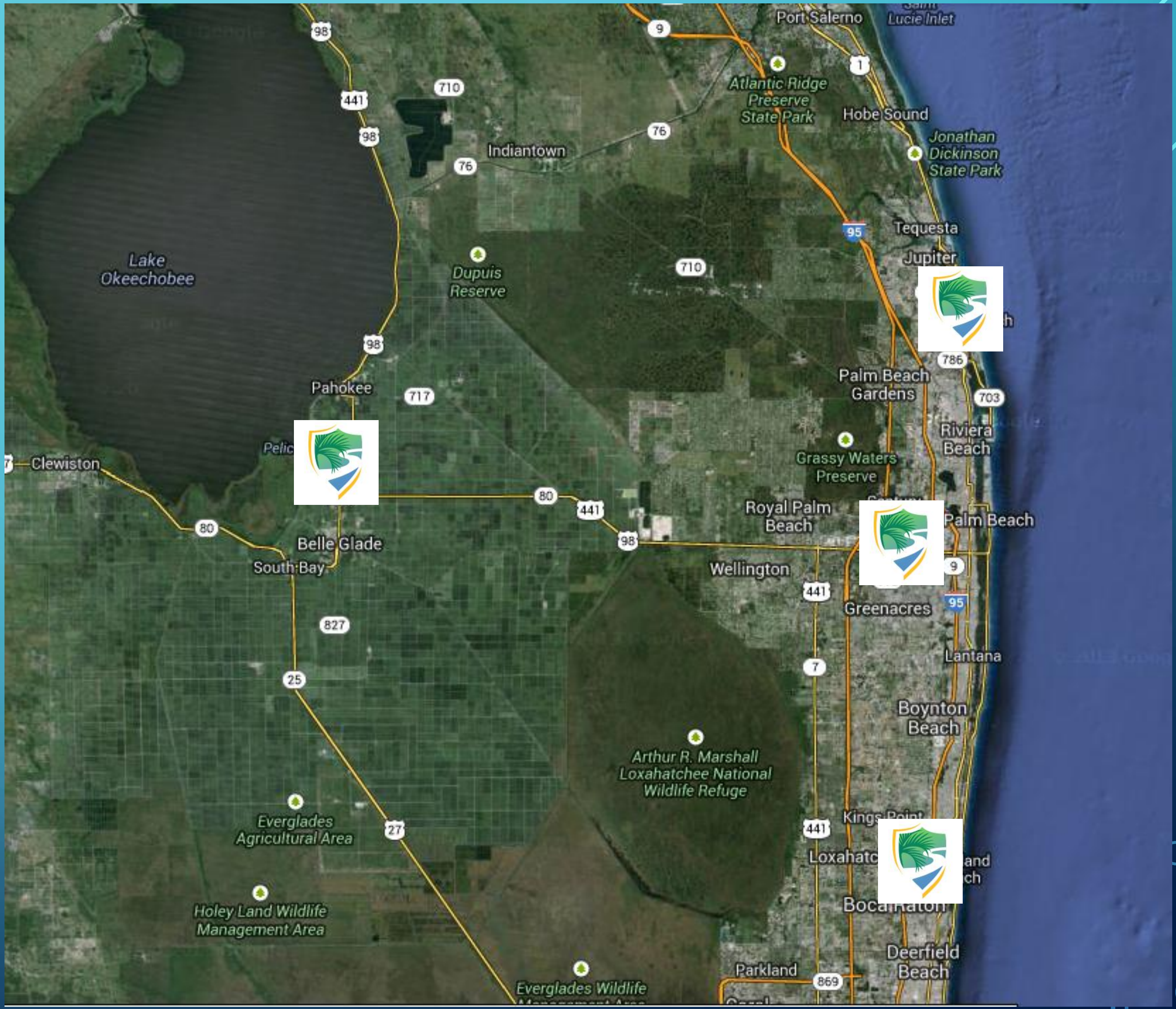
REPORT OF FINDINGS: COLLABORATION WITH OSISOFT IN DEVELOPMENT OF ENERGY MANAGEMENT TECHNOLOGY LEARNING LABORATORY

Presented by **Jay Harold Matteson, PhD, MS**

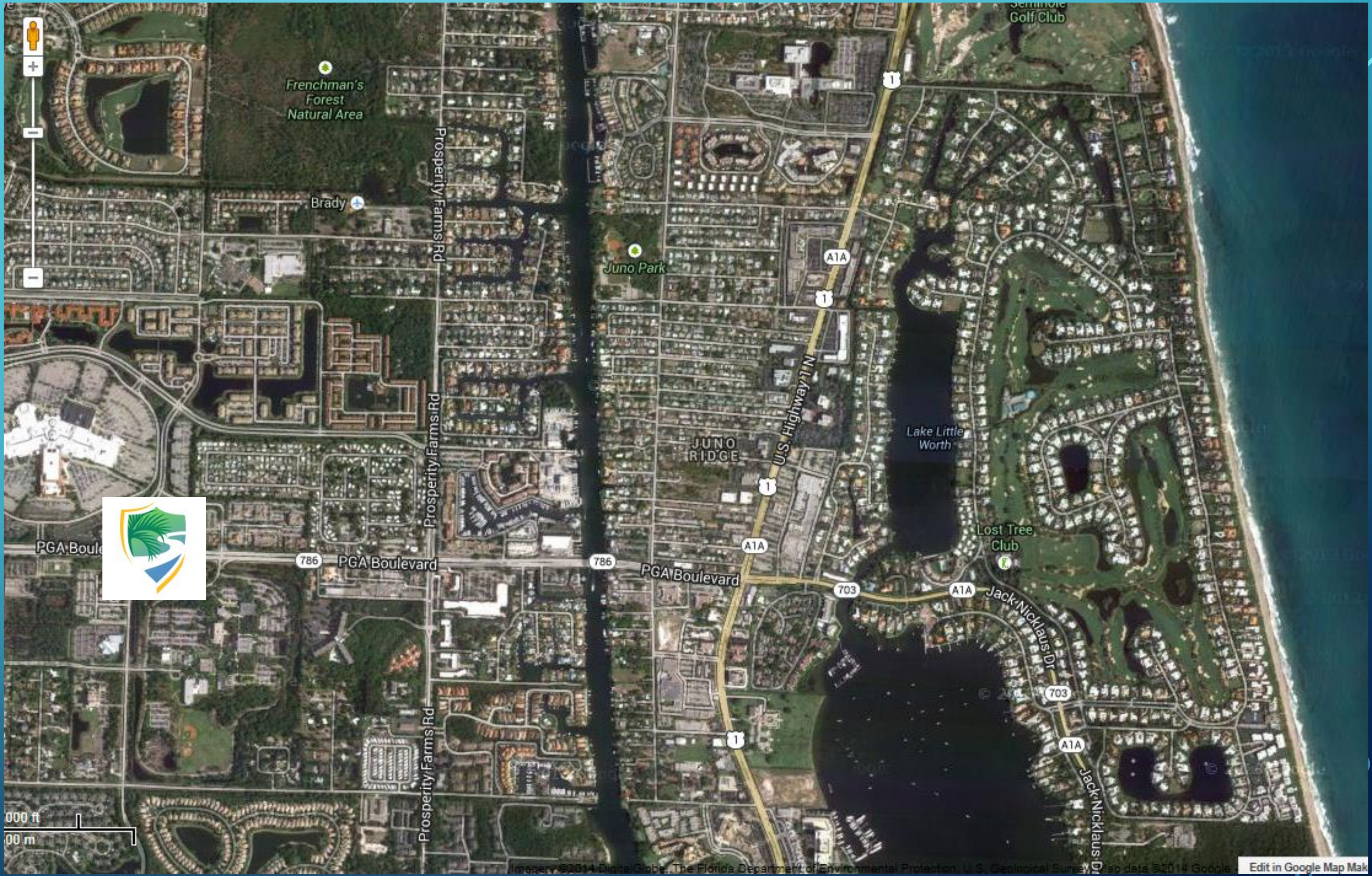
PALM BEACH STATE COLLEGE

Institute for Energy & Environmental Sustainability

PALM BEACH COUNTY



PERSPECTIVE



PALM BEACH GARDENS CAMPUS

BIOSCIENCE TECHNOLOGY COMPLEX

BUSINESS & INDUSTRY PARTNERS

OSIsoft.

FPL.

NEXTera ENERGY

Sikorsky
A United Technologies Company

Wheelabrator Technologies Inc.
A Waste Management Company

Pratt & Whitney
A United Technologies Company

SWA
SOLID WASTE AUTHORITY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
sfwmd.gov

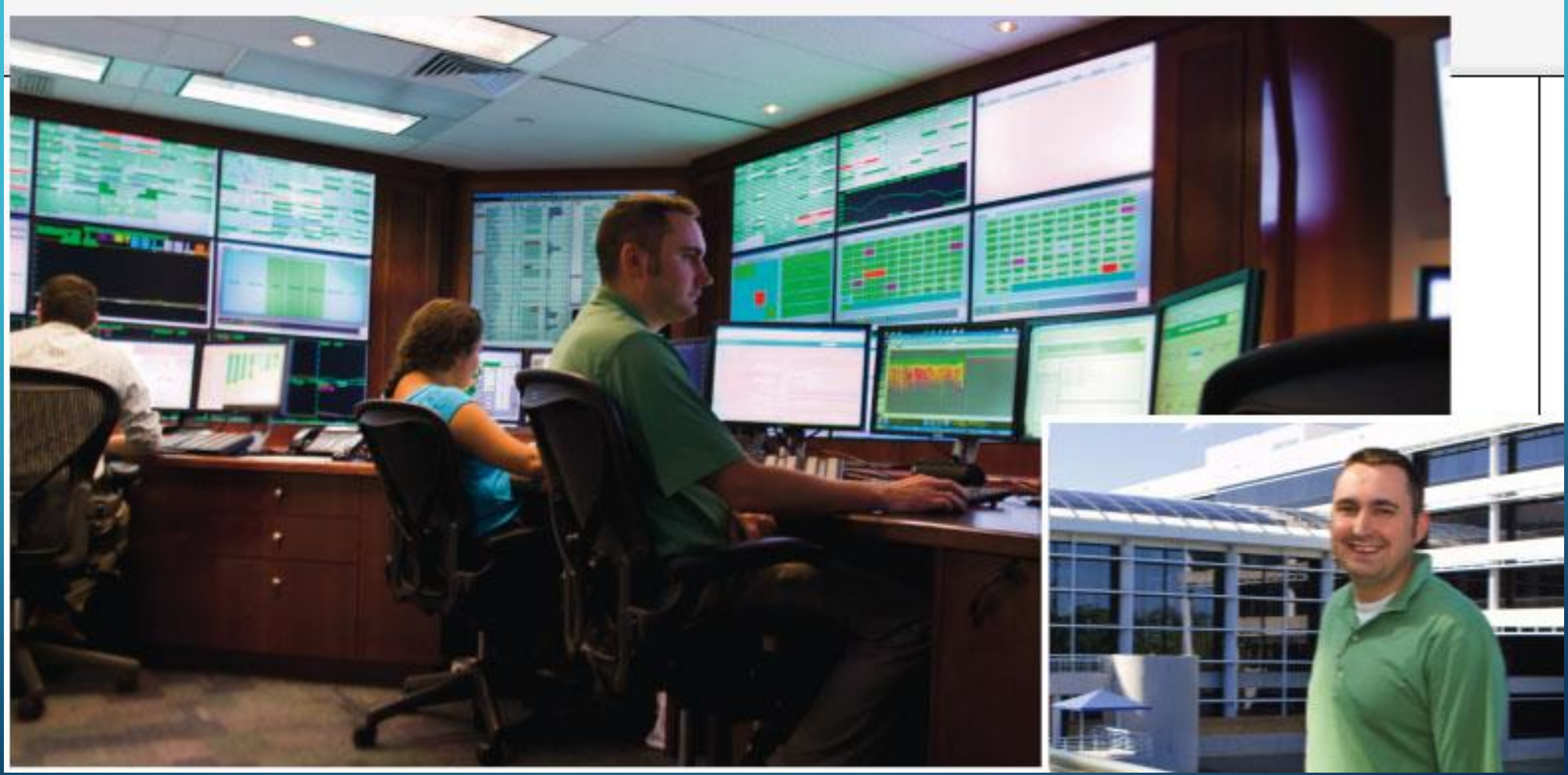
Florida Turbine Technologies, Inc.
Providing Innovations That Work™

B&W thebabcock&wilcoxcompany

VENERGY GROUP
Custom Energy Savings Solutions

PSM
AN ALSTOM COMPANY

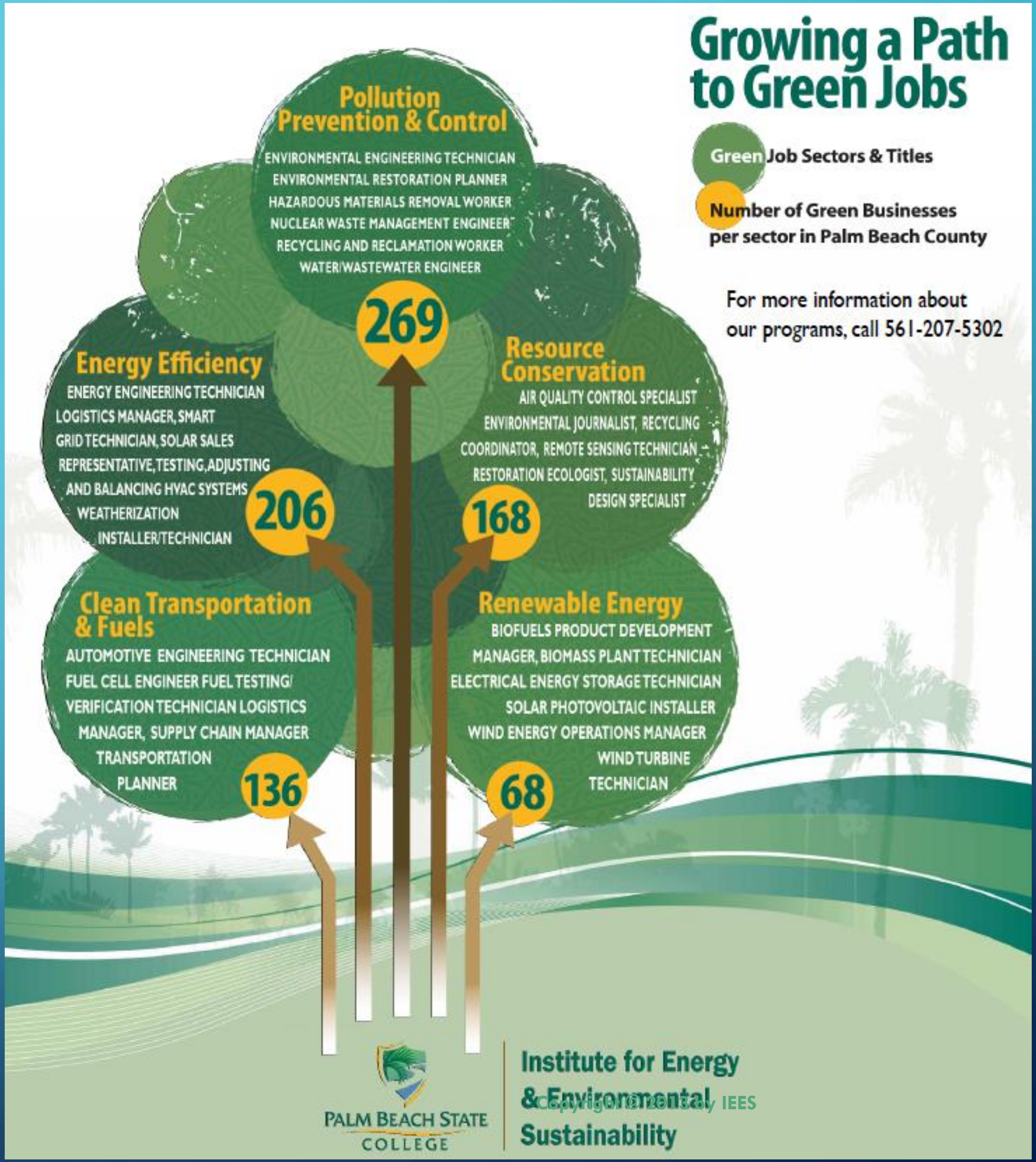
SMART GRID GRADUATES GO-TO-WORK



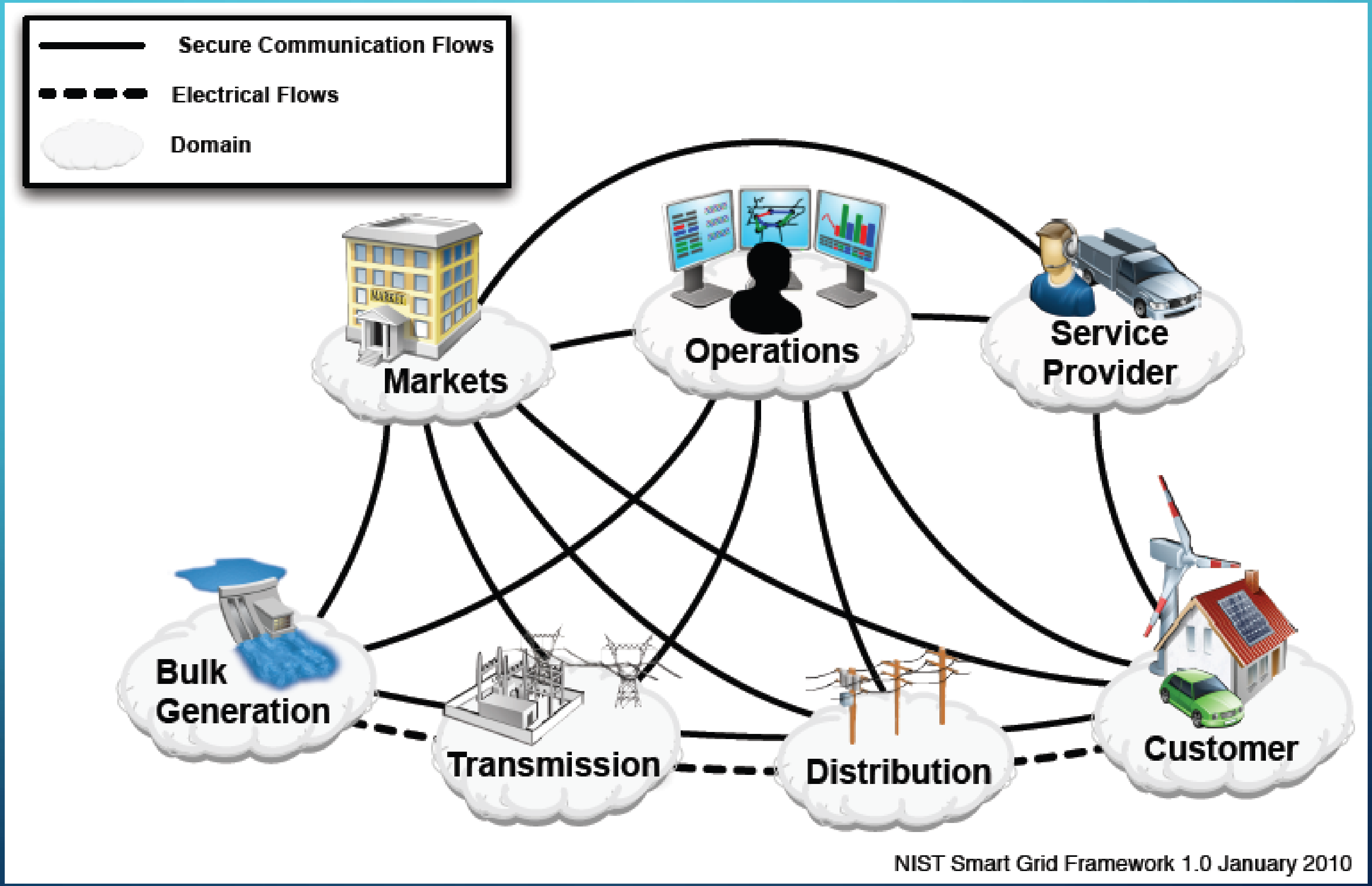
Peter Szarowicz at work in the wind turbine operations center at NextEra Energy Resources

PERFORM NEEDS ASSESSMENT

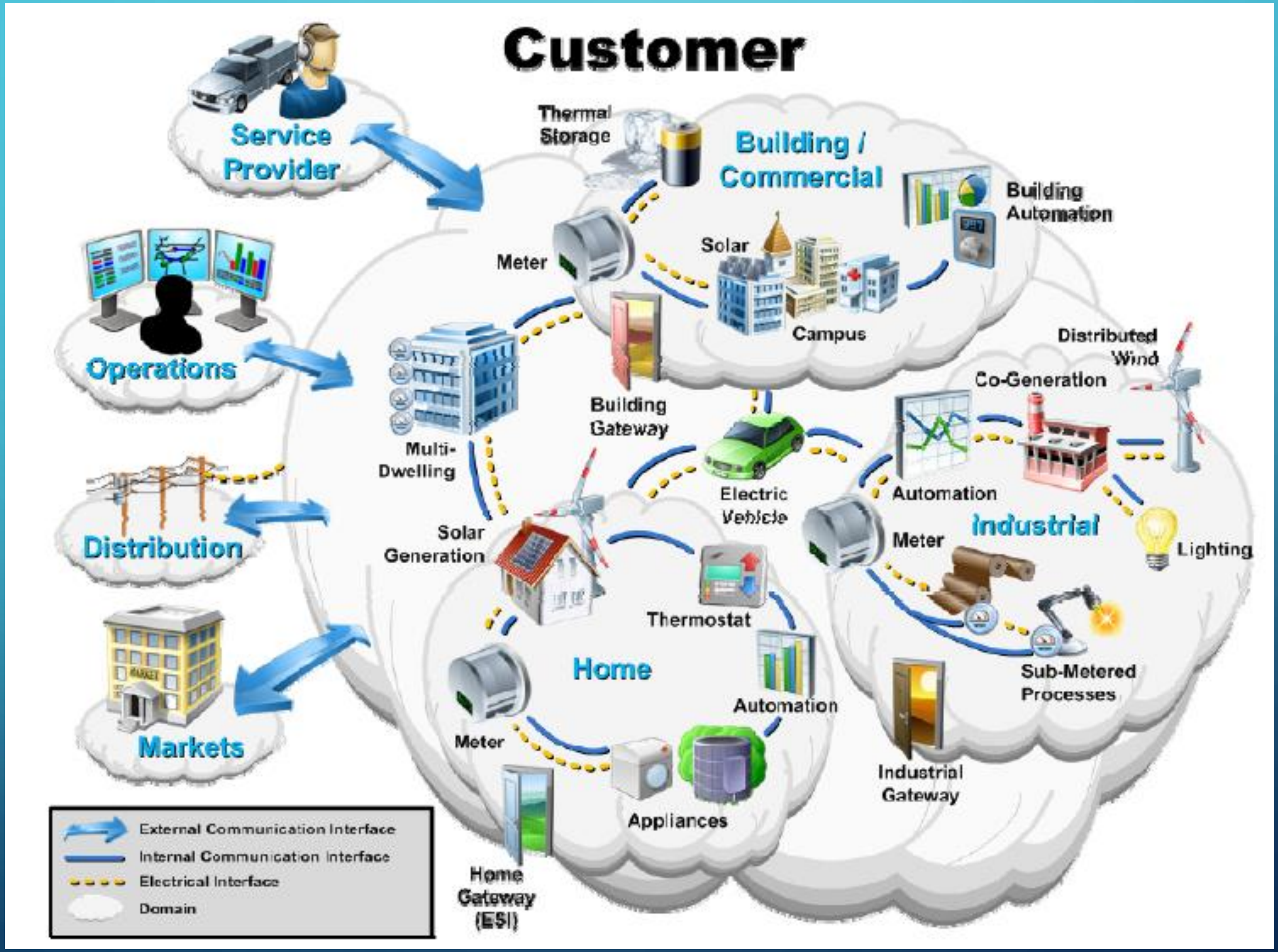
Work with business and community partners to develop curriculum and infrastructure for education & technical training in STEAM occupations



NIST Smart Grid Conceptual Model



NIST Smart Grid



INSTRUCTIONAL DESIGN

Authentic	Tasks
STEM	Knowledge
Applied	Skills
Optimize	Abilities

Search by Keyword

Perform Occupational Task Analysis by Knowledge, Skills and Abilities

REFERENCE: [HTTP://WWW.ONETONLINE.ORG/](http://www.onetonline.org/)

O*NET OnLine

A proud partner of the americanjobcenter network

Occupation Quick Search:

Help | Find Occupations | Advanced Search | Crosswalks | Share | O*NET Sites

Quick Search for:
energy management

Occupations matching "energy management"

The search results are listed in a rank order that is calculated on the relevance of the occupational title, alternate titles, description, tasks, and detailed work activities associated with the keyword you entered.

Select the **Relevance Score** to view the specific items matched by your search within the occupation.

Relevance Score	Code	Occupation
100	17-2199.03	Energy Engineers Bright Outlook Green
90	11-9199.10	Wind Energy Project Managers
87	13-1199.01	Energy Auditors
85	41-3099.01	Energy Brokers
75	17-2199.11	Solar Energy Systems Engineers
63	47-1011.03	Solar Energy Installation Managers
62	17-2199.10	Wind Energy Engineers
61	25-9021.00	Farm and Home Management Advisors
50	11-9013.02	Farm and Ranch Managers
50	13-1199.05	Sustainability Specialists
49	11-9021.00	Construction Managers
47	47-4099.03	Weatherization Installers and Technicians
47	11-9199.09	Wind Energy Operations Managers
46	41-4011.07	Solar Sales Representatives and Assessors
44	43-1011.00	First-Line Supervisors of Office and Administrative Support Workers
43	17-2141.00	Mechanical Engineers
42	11-1011.03	Chief Sustainability Officers
40	15-1199.12	Document Management Specialists
40	17-2071.00	Electrical Engineers
39	11-9161.00	Emergency Management Directors

REFERENCE: HTTP://WWW.ONETONLINE.ORG/FIND/QUICK?S=ENERGY+MANAGEMENT

Perform Review by Category: Wages & Employment Trends

Wages | Employment Trends

ENGINEERS, ALL OTHER: FLORIDA

Occupation Description

All engineers not listed separately.

State and National Wages

Wage Table | Hourly Wage Chart | Yearly Wage Chart

Location	Pay Period	2012				
		10%	25%	Median	75%	90%
United States	Hourly	$23.88	$33.07	$44.24	$56.08	$68.15
	Yearly	$49,700	$68,800	$92,000	$116,600	$141,800
Florida	Hourly	$23.12	$32.14	$43.60	$54.20	$62.27
	Yearly	$48,100	$66,900	$90,700	$112,700	$129,500

Reference:
Engineers - Florida

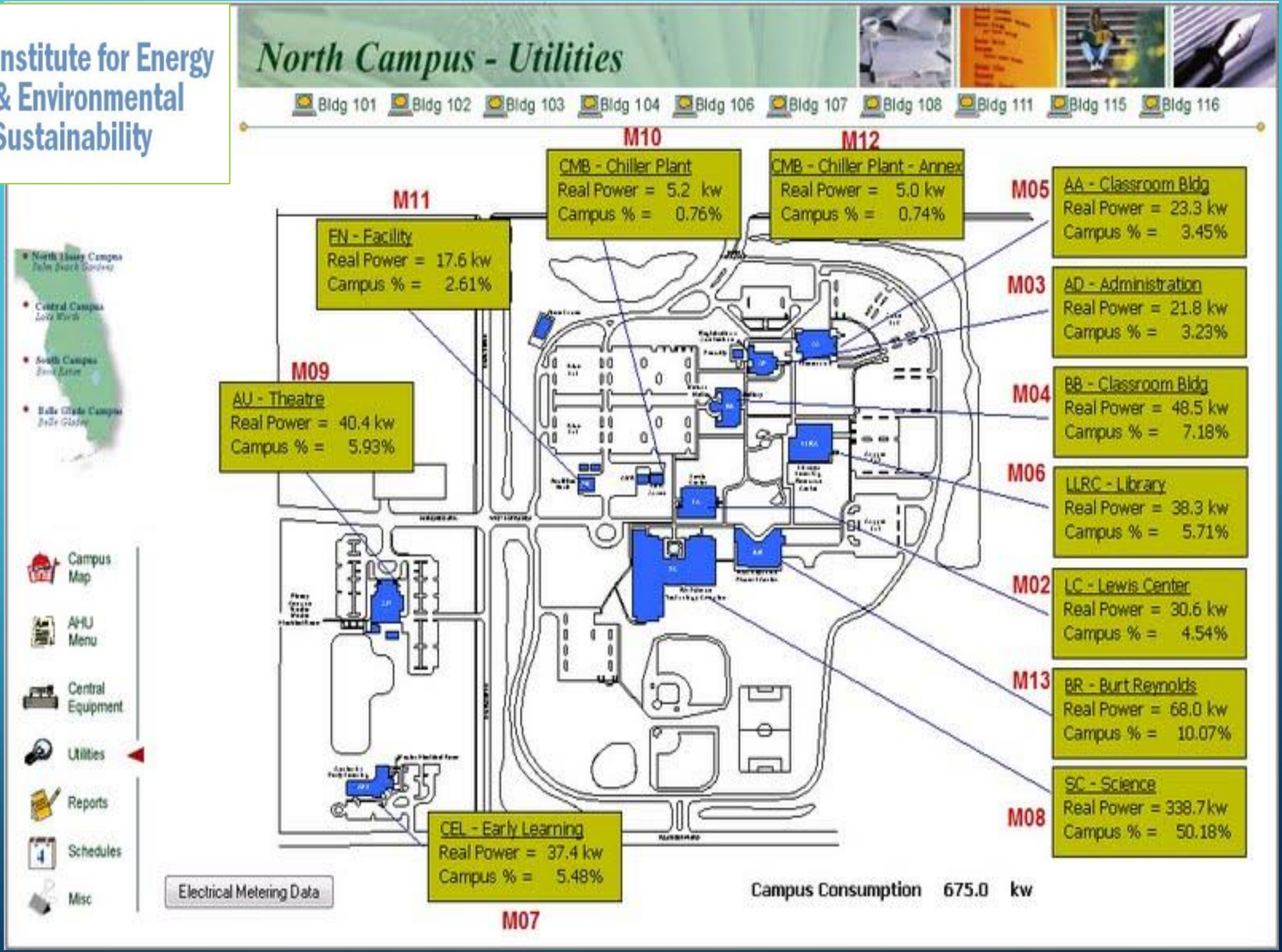
EXPERIENTIAL LEARNING: ENERGY MANAGEMENT ANALYTICS & TECHNOLOGY

SUB-METERING ENTIRE CAMPUS AS A LEARNING LABORATORY

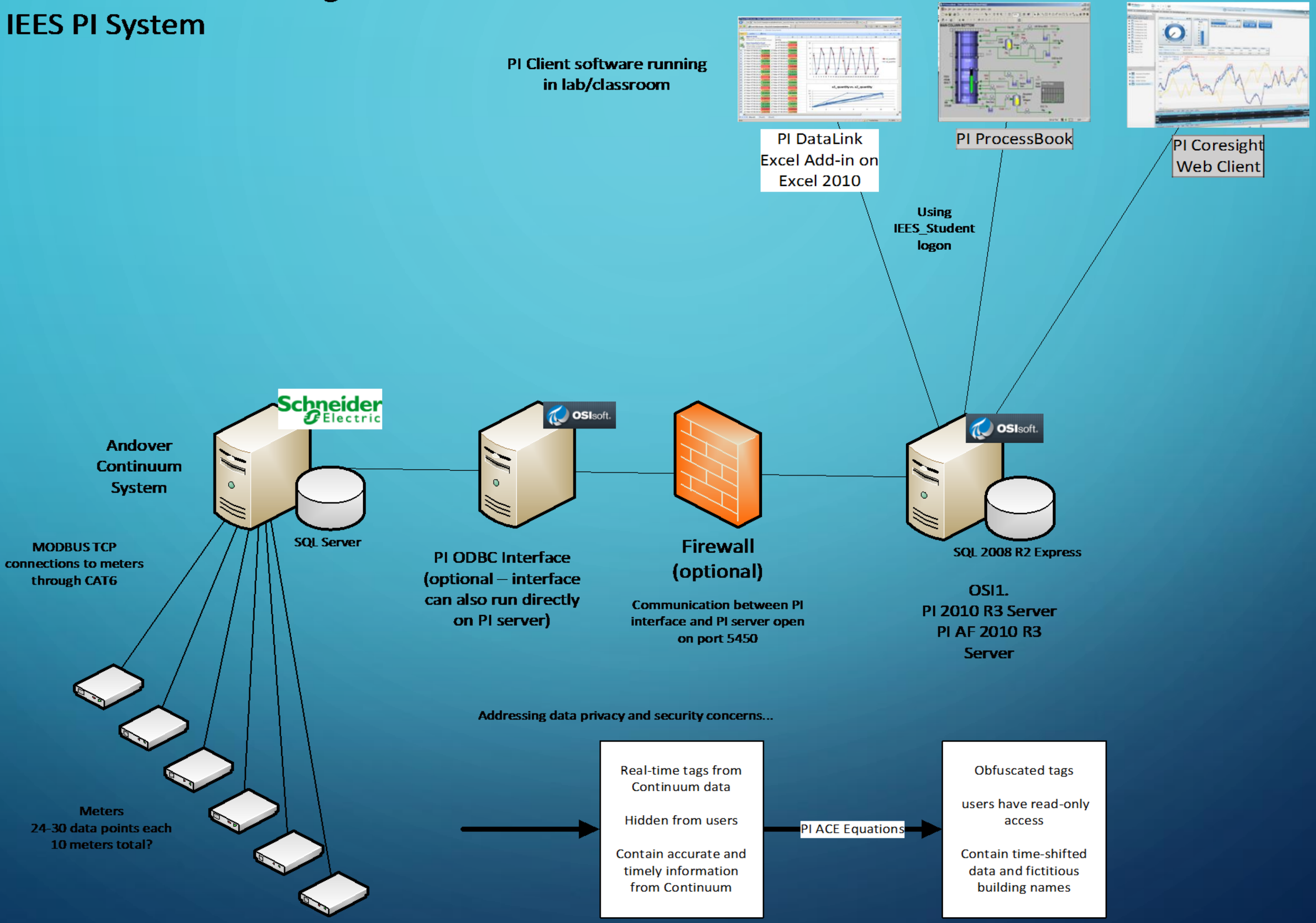
- Meters installed in every building on Palm Beach State's Gardens (North) campus
- About 900+ days worth of data saved
- Measures 3 phase current, voltage, power factor, current power, totalized kwh

PALM BEACH STATE COLLEGE

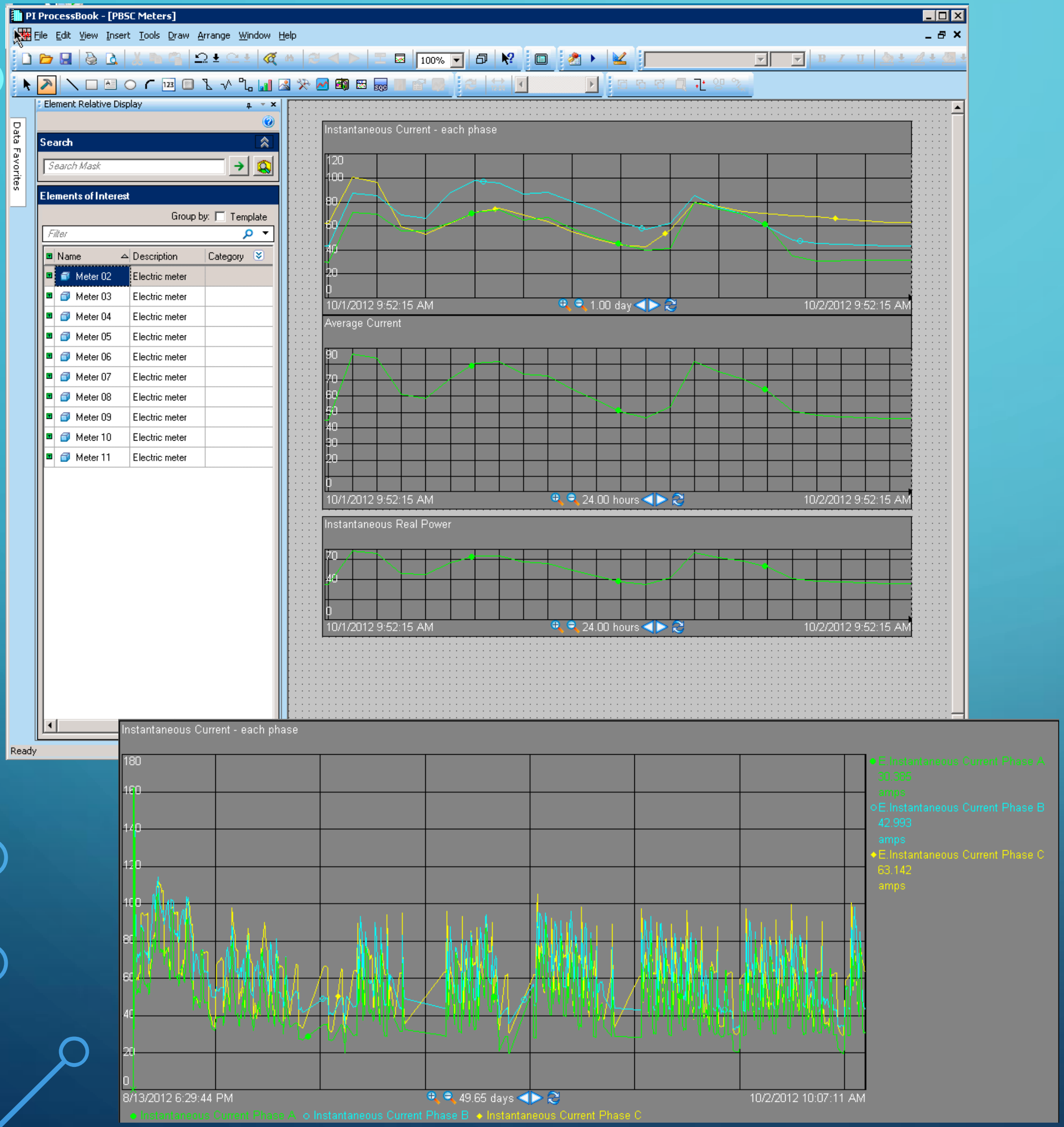
Institute for Energy & Environmental Sustainability

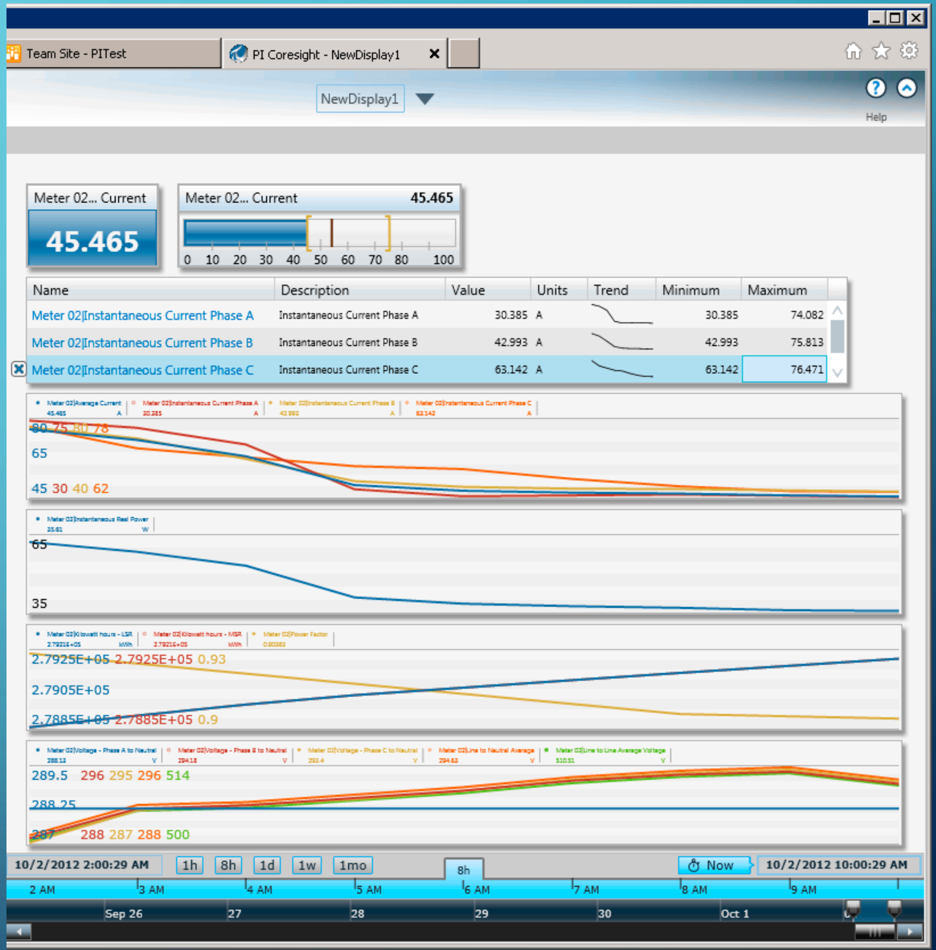


Palm Beach State College
IEES PI System



Develop Visual Analytic Dashboards

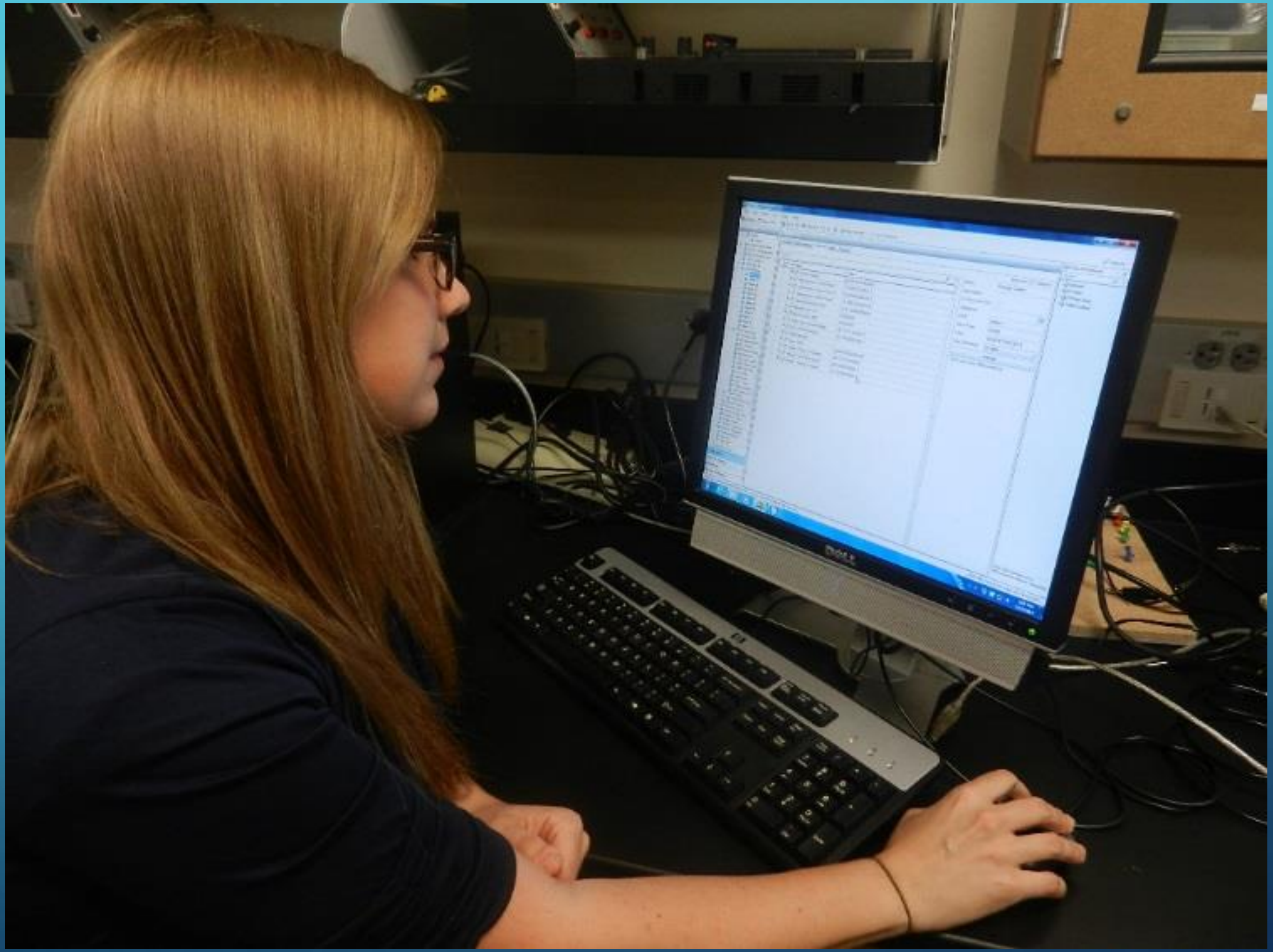


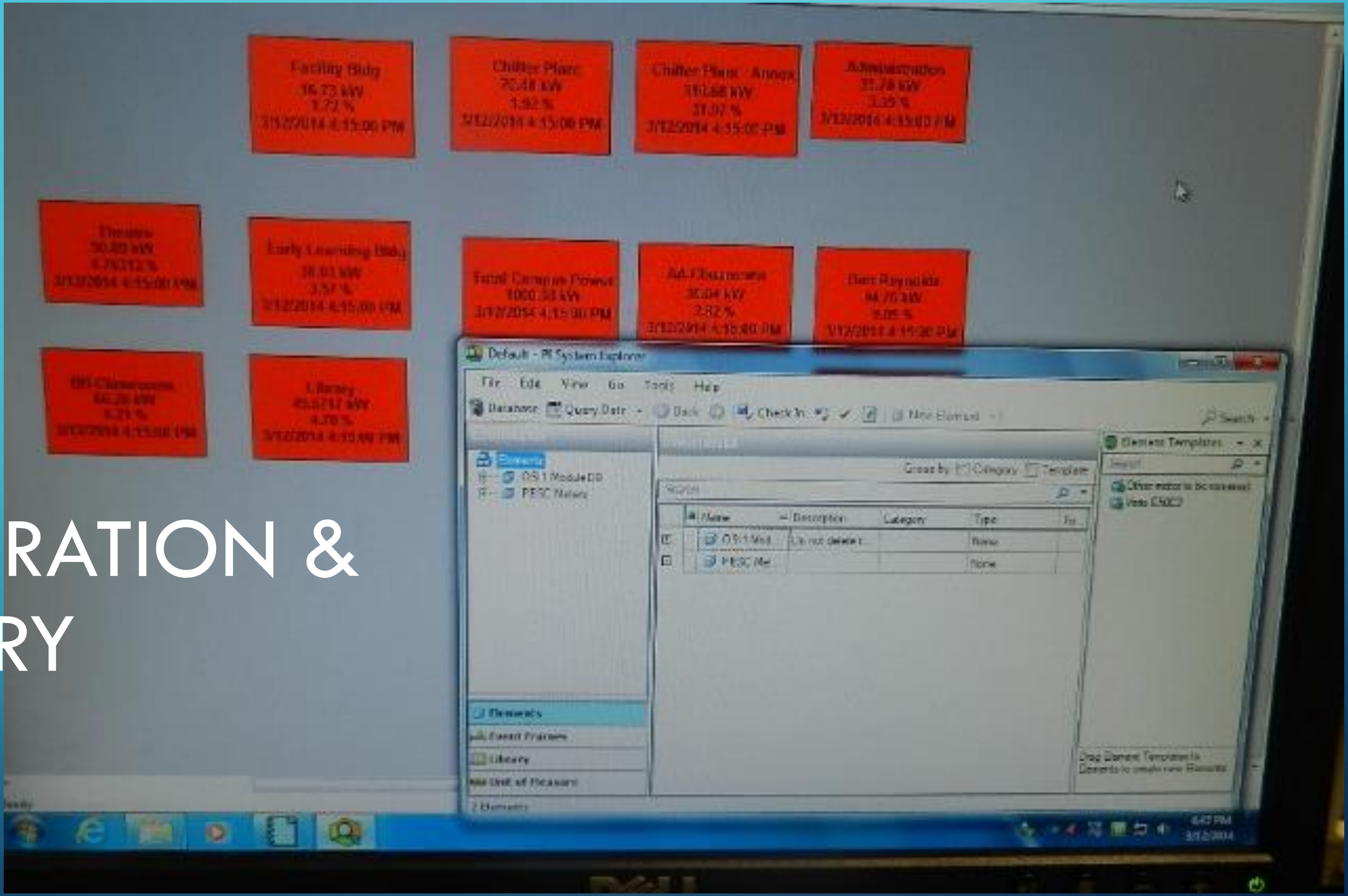


ADVANTAGES

- Access to real-world data
- Learn to use industry standard software
- Learn concepts of data collection, storage, and analysis applicable to any system
- Problem solving, critical thinking: What can I do with this information?

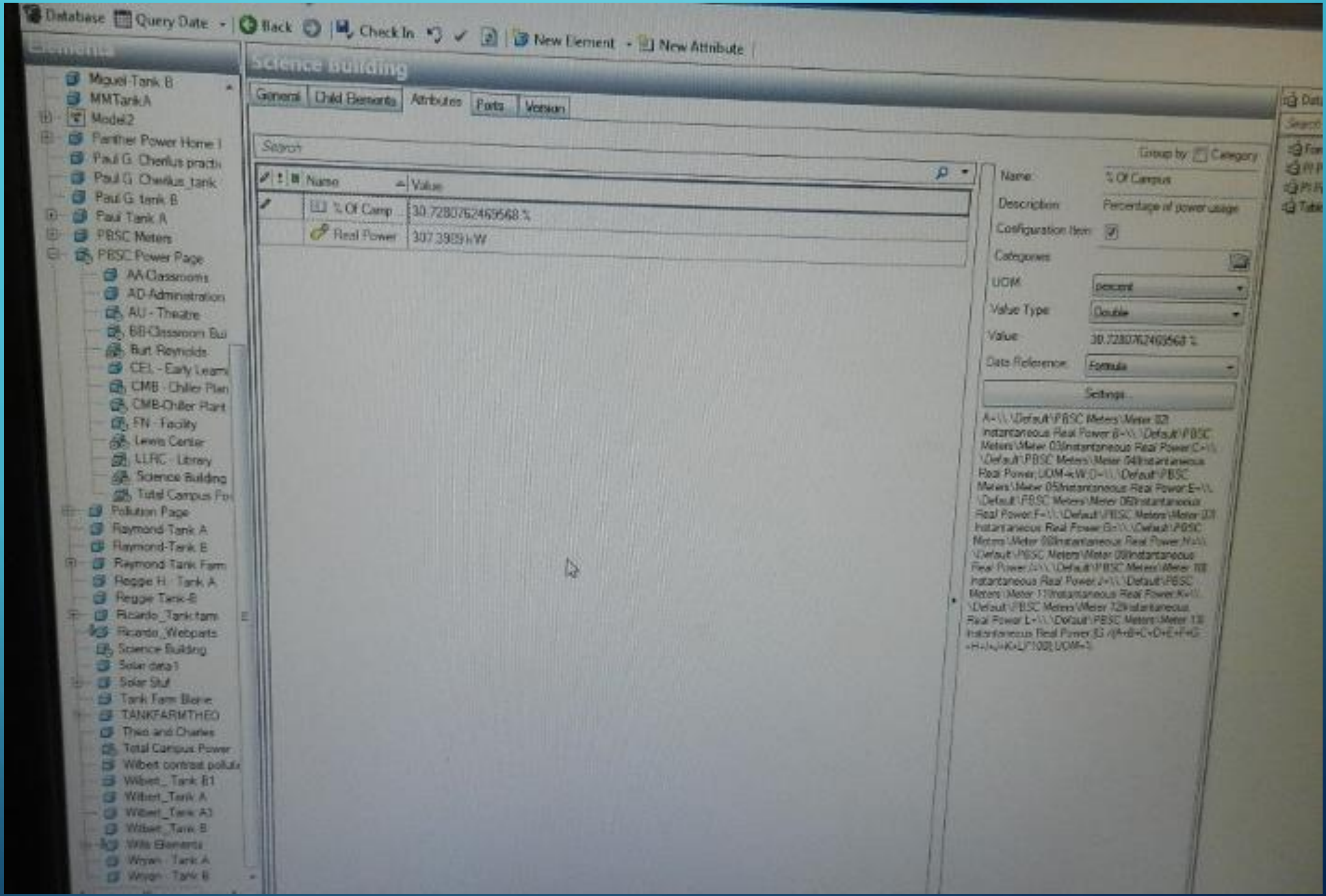
WORKING WITH BUSINESS PARTNERS PROVIDES STUDENTS WITH CAREER BUILDING PATHWAY



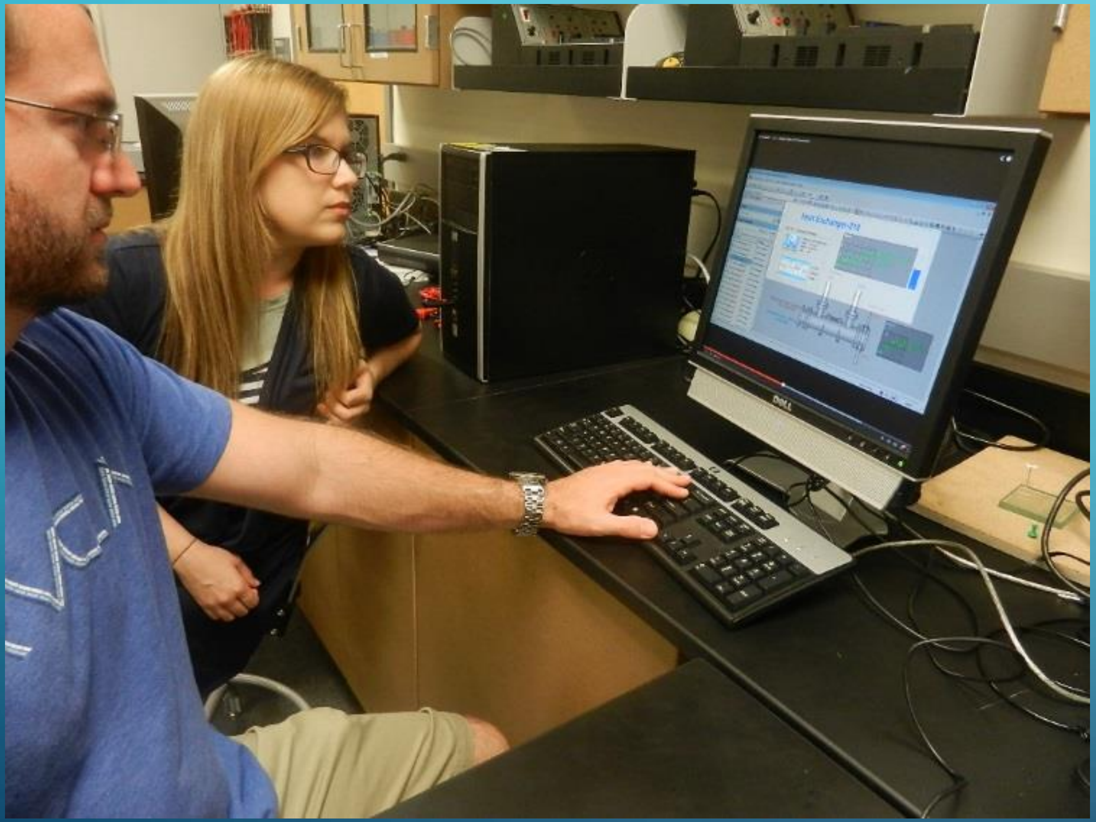


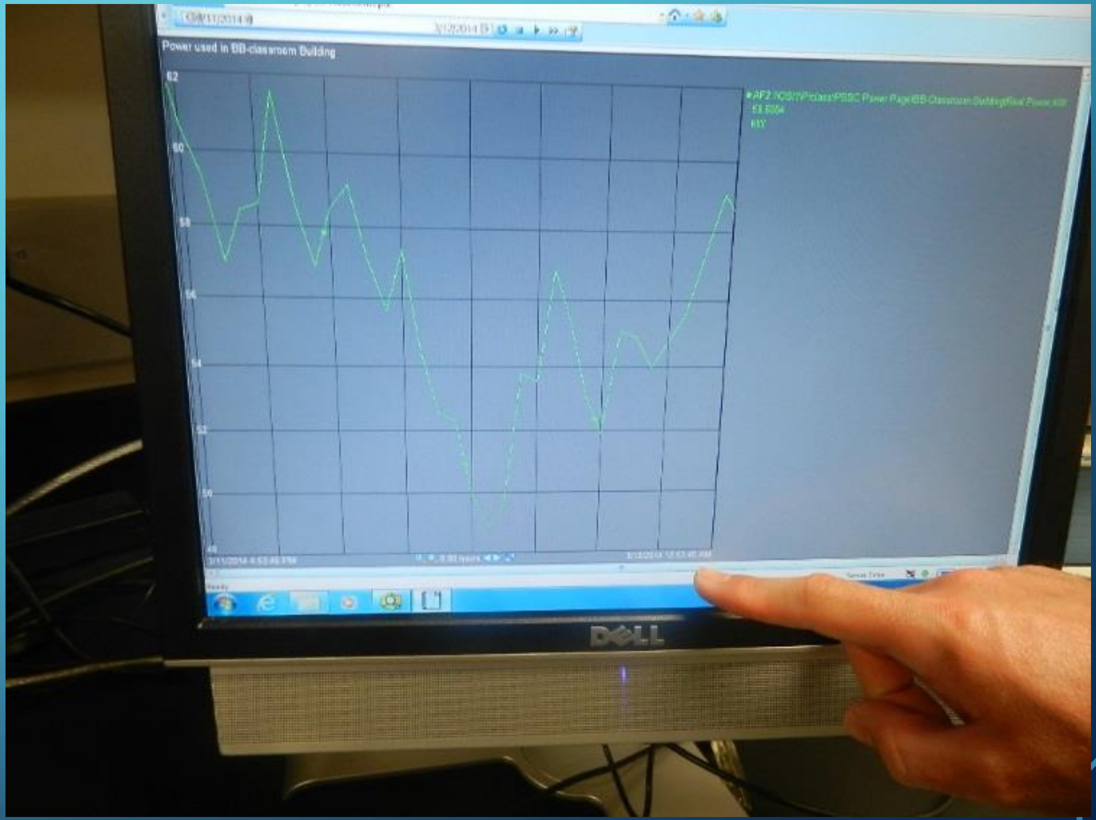
EXPLORATION & INQUIRY

CREATE MATH MAGIC

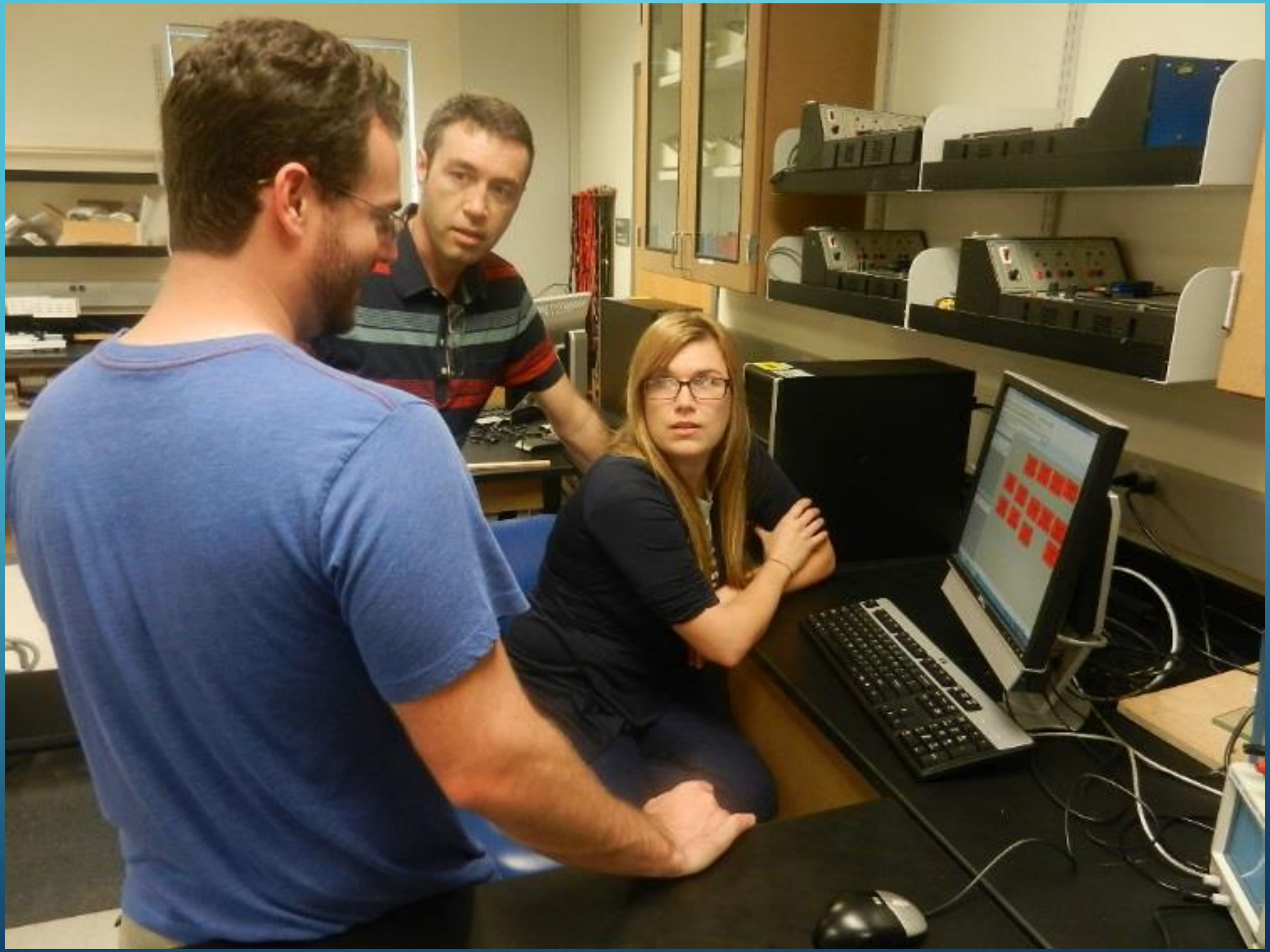


WORK IN TEAMS: BUILD DESIRE TO LEARN, SOFT SKILLS, AND ATTENTION TO DETAIL





PROFESSORS AND STUDENTS WORK AS CO-CONSTRUCTIVE PARTNERS IN LEARNING



CREATE CURRICULUM & STACKABLE CERTIFICATES WITH INDUSTRY GUIDANCE

DEVELOP STANDARDIZED LESSON PLANS: ASSESSMENT, RESEARCH AND MEASUREMENT

Enhanced Power Quality and Reliability for Smart Grid – Lesson Plans

PALM BEACH STATE COLLEGE | Institute for Energy & Environmental Sustainability

LESSON PLAN 4: Smart Grid Communications Network

Section 1: Introduction	
Intro statement	Purpose of this lesson is to describe Smart Grid communications network. It is a multi-tier communications network, comprised of many different sub-networks that need to interoperate seamlessly. Issue of critical infrastructure protection, as mandated by NERC, is explored as how it applies to Smart Grid communication network. Standards, bodies and alliances for Smart Grid communication networks are presented, and their individual advantages and disadvantages are explored.
Length of Lesson	2 hours
Notes or advice to other teachers	The goal of this lecture is to introduce the students to the complexity of Smart Grid communications network, including the various types of subsystems, the issues associated with such complexities and different goals for different subsections. This will provide an important foundation for future discussions and presentations of Home Area Networks for Smart Grid.

Section 2: Purpose	
Key questions to address	Smart Grid communications network is a multi-tier communications network, comprised of many different sub-networks that need to interoperate seamlessly. Issues of interoperability and standards are presented. Issue of critical infrastructure protection, as mandated by NERC, is explored as how it applies to Smart Grid communication network. Standards, bodies and alliances for Smart Grid communication networks are presented, and their individual advantages and disadvantages are explored.

LESSON PLAN 5: SCADA

Section 1: Introduction	
Intro statement	In previous lessons we learned about instrumentation and the concept of analog to digital or A/D conversion. We learned that A/D conversion allows a digital-based computer to measure an analog signal and represent it in a digital form. In this lesson we will look at the next level in the chain, the computer systems that collect these measurements and control actions in the electric grid. You will probably hear many different names for these systems and this area is very quickly evolving. For the most part, SCADA, or Supervisory Control and Data Acquisition, is the name that you will hear most often. There are many different components to SCADA. At the base are embedded computers, usually referred to as Programmable Logic Controllers, or PLC's. These PLC's contain interface cards that allow the computers to collect data from instrumentation and take physical actions. These PLC's are the first step up the chain that starts to introduce intelligence into the system.
Length of Lesson	3 hours lecture
Note or advice to other teachers	Now that we know about the overall concept of telemetry and understand instruments, it is time to start introducing the computer equipment that starts to introduce intelligence into the field devices. This lesson provides the ground work for the next several lessons. It is important for the students to understand that PLC's are the computer devices that take measurements in the field and can cause actions to be taken in the field. They are intelligent programmable devices that can not only take local readings and take high speed actions as a result of those readings, but they are also involved in sending that information up the chain.

LESSON PLAN 12: Data Historians – The PI System

Section 1: Introduction	
Intro statement	Purpose of this lesson is to introduce data historians, and the basics and details of the OSIsoft's PI System. This lesson will explore how data is organized in the PI system, and how to search for data.
Length of Lesson	3 hours lecture
Note or advice to other teachers	Understanding the PI flat tag model and the hierarchical structure of AF will be important in understanding future lessons. This lesson should provide plenty of hands on access to the PI system, allowing the students to start working with the PI tag search interface. They should also start to use the PI System Explorer and use it to build some hierarchies. Encourage them to remember that they will ultimately need these skills for their final project. Spending time reviewing the user manuals and exploring hands-on will pay off in the end.

Section 2: Purpose	
Key questions to address	How does PI compress time-series data? What are the advantages in compressing time-series data? How does PI store time information? What does a typical PI system look like? What is the architecture of your specific PI system (if you have one)? What are the various subsystems of the PI system and what is their purpose?

ESTABLISH COLLEGE CREDIT CERTIFICATE

Alternative Energy Engineering Technology

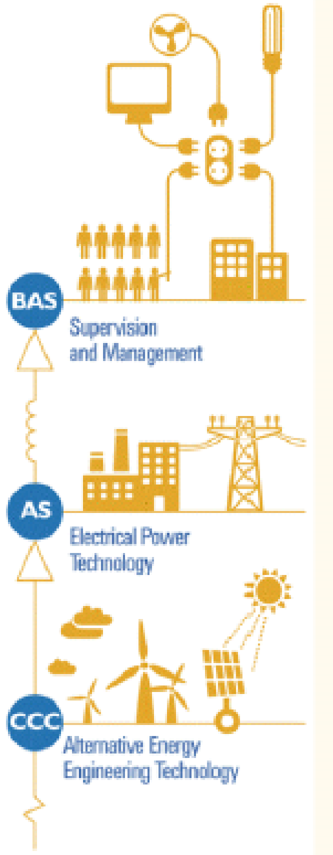
College Credit Certificate (CCC)

If you are interested in sustainable energy and want to build a rewarding career in a rapidly growing industry, then this program is for you.

Your Training: Through hands-on learning activities in well-equipped classrooms, you'll study bio-fuels, wind and solar energy, and environmental mapping technologies, among other topics central to understanding current practices in sustainable green energy generation.

Your Career: This unique program prepares students for entry-level opportunities in the alternative energy industry. Technicians and others working in the electrical power industry will gain options for career growth and advancement.

Keep Learning: Credits from this certificate transfer into the College's Associate in Science degree in Electrical Power Technology.

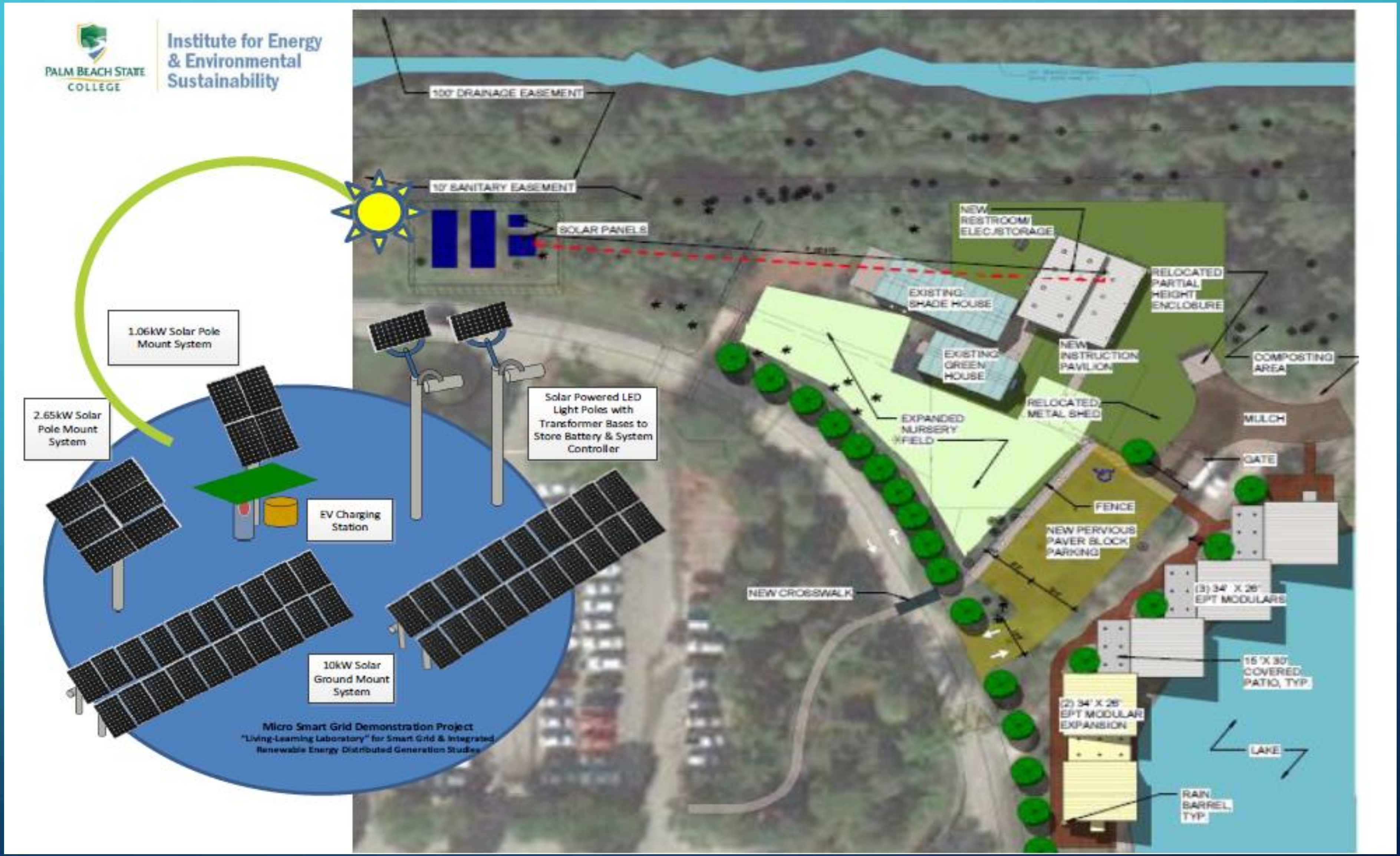


Course Sequence

Ccc-Alt Energy Eng Tech (CCC 6272)

Term One - Fall (Year One)		**Credits: 9**
ETP1200	Power Plant Science (AS)	3
ETI1701	Environmental Health and Safety (AS)	3
EVR2266	Survey of Environmental Mapping/GIS/Remote Sensing (AA)	3
Term Two - Spring (Year One)		**Credits: 9**
ETP1511	Introduction to Bio Fuels (AS)	3
ETP1530	Introduction to Wind Energy (AS)	3
ETP1402	Introduction to Solar Energy (AS)	3
		Total Program Credits: 18

MICRO SMART GRID LEARNING LABORATORIES



CREDITS: IT'S ALL ABOUT THE STUDENTS

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- Palm Beach State College

THANK YOU

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