

Introduction of the Power Program at USF

Graduate Student Orientation

Lingling Fan

<http://power.eng.usf.edu>

Aug. 23, 2019

Electric Power Engineering

Power Systems

Utility industry

Tampa Electric

Duke Energy

Florida Power & Light

Manufacturers

SEL, GE, ABB,
Siemens, EATON

Power Electronics

Inverter Manufacturers

Jabil

GE Aviation

Solar PV industry: First
Solr

Electric Machines

Wind industry

Siemens Gameasa

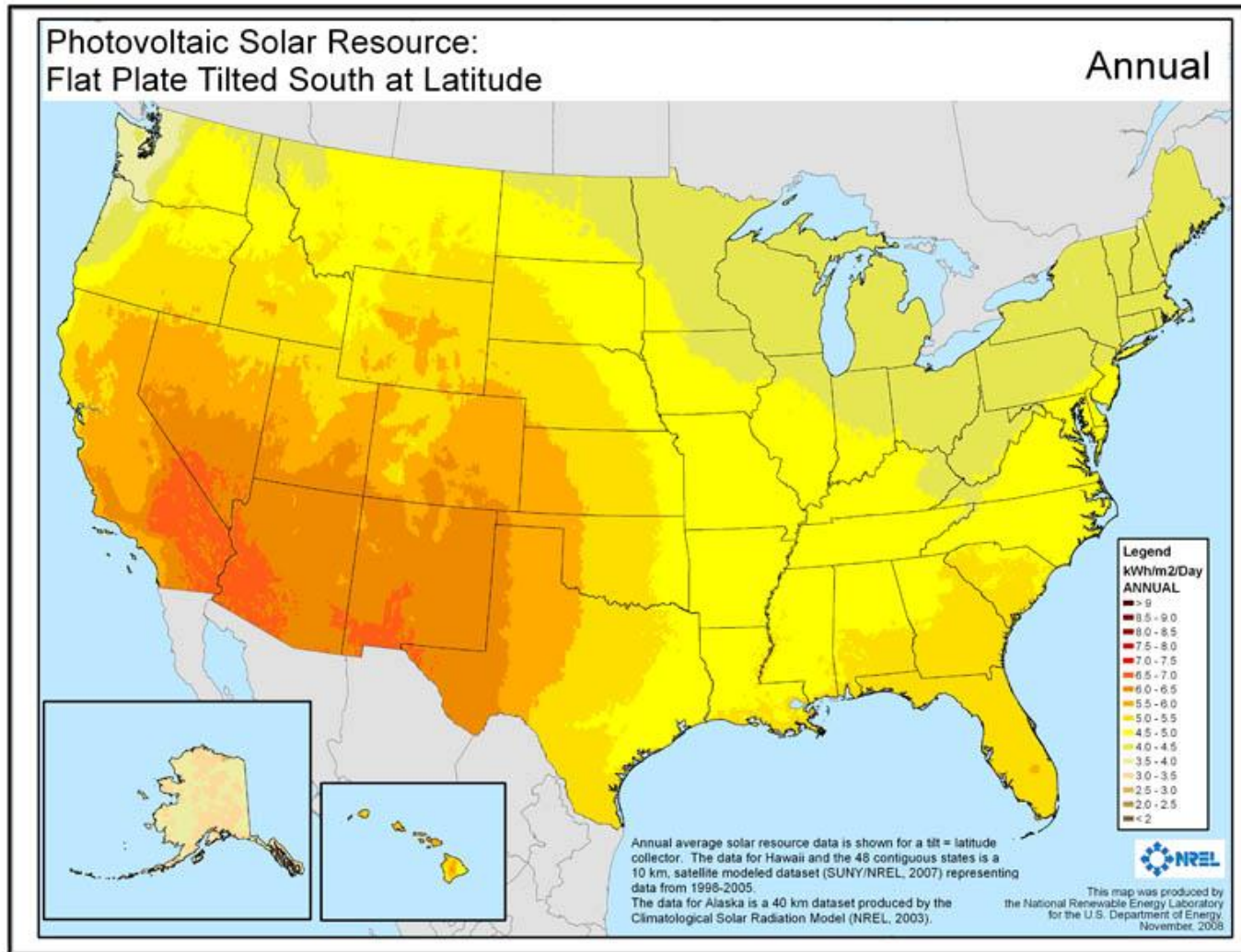
Vestas

GE Wind Power

Electric Vehicle
industry

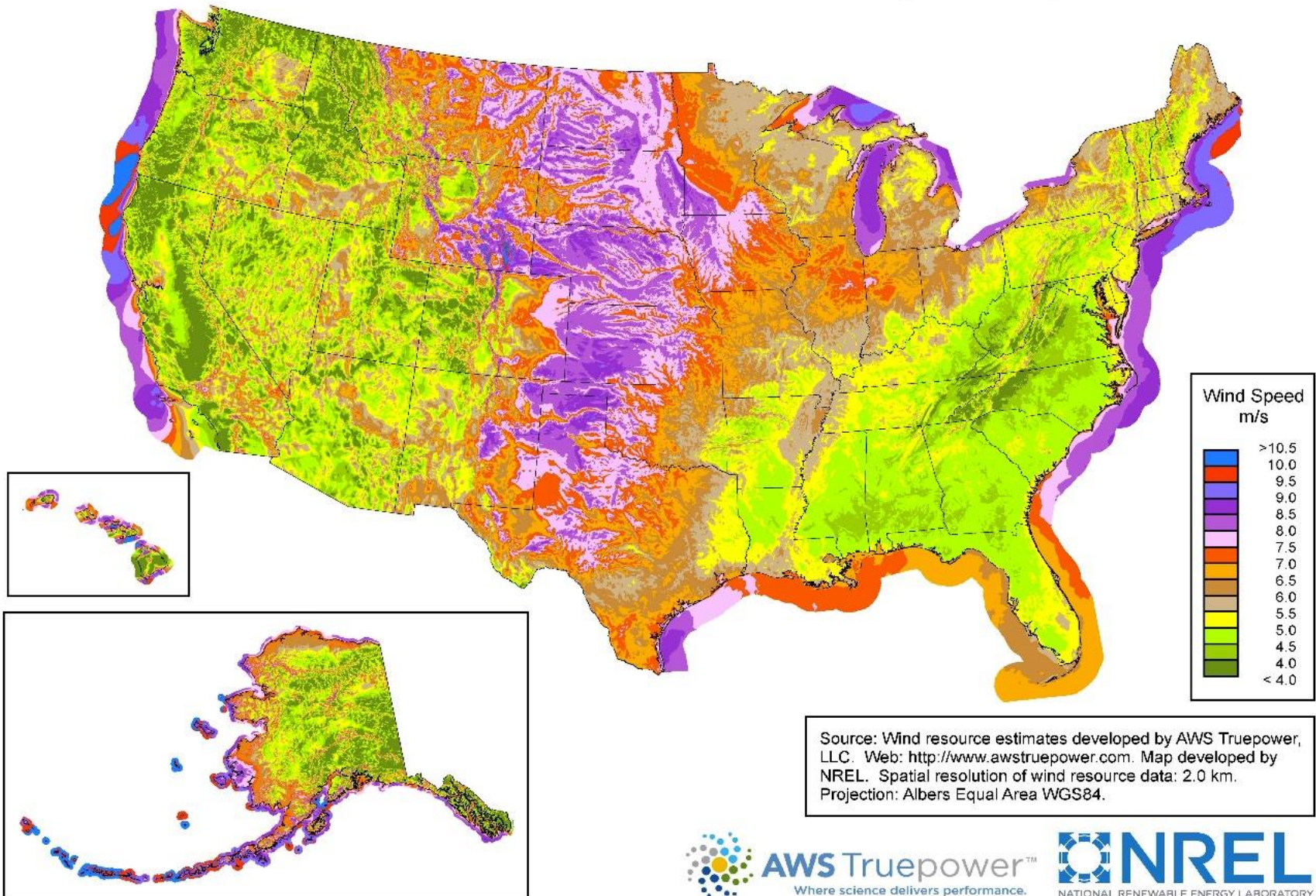
Tesla

Today's grid: high penetration of inverter-based resources

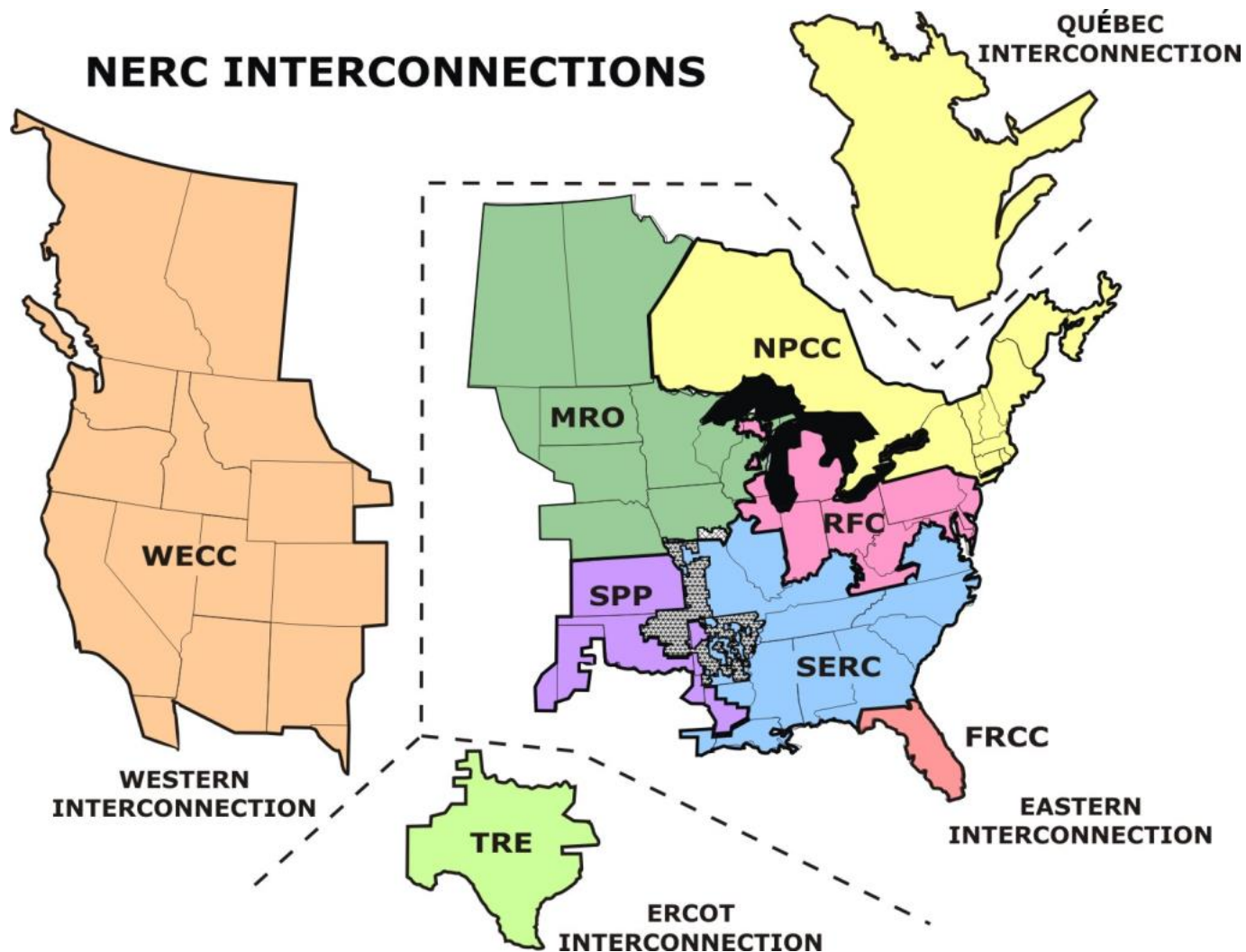


Source: NREL

United States - Land-Based and Offshore Annual Average Wind Speed at 80 m



NERC INTERCONNECTIONS



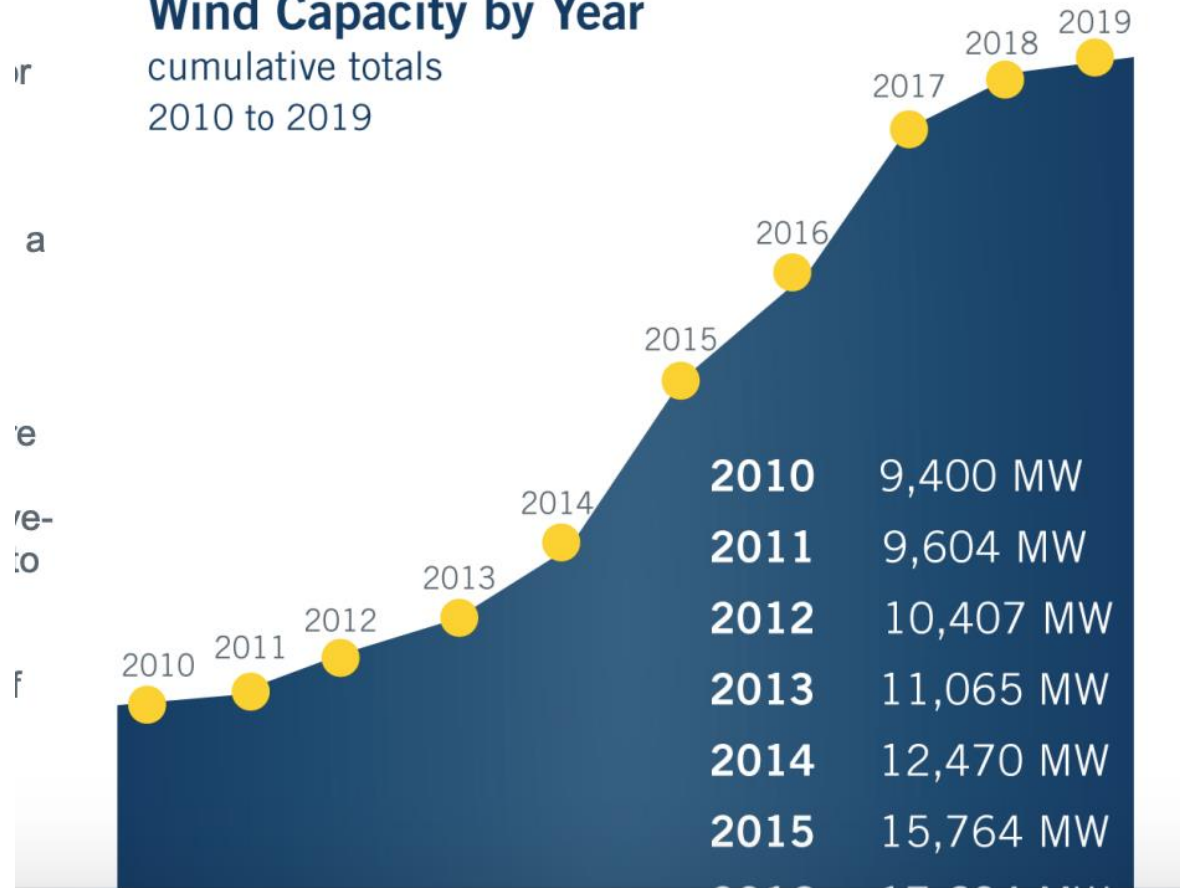
Source: NERC

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- **Wind penetration record** – 56% on Jan. 19, 2019 at 3:10 a.m.

Wind Capacity by Year

cumulative totals
2010 to 2019



Source:

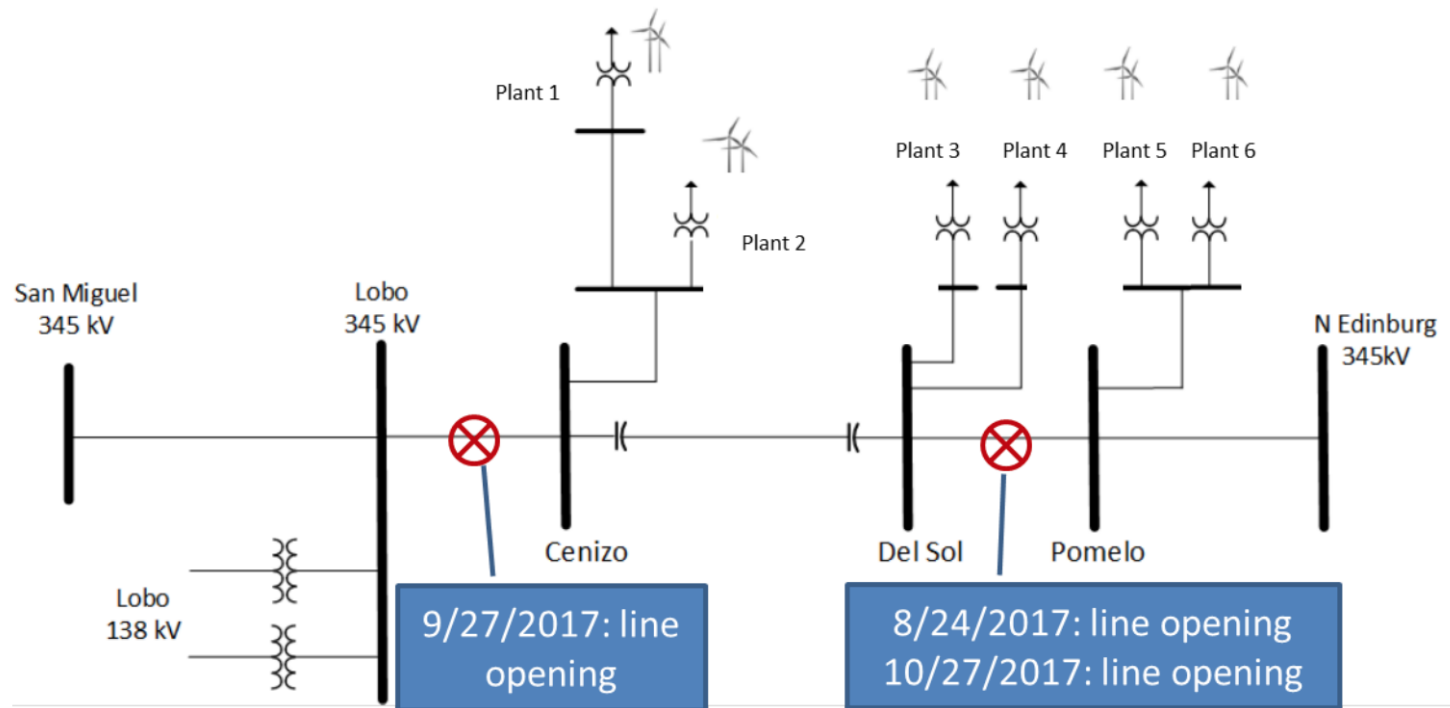
http://www.ercot.com/content/wcm/lists/144927/Wind_One_Pager_Revised_July_2019.pdf

Today's urgent power grid needs

Case 1: August 24th, 2017, Del Sol – Pomelo line outage and Plant 3 and 4 tripped

Case 2: September 27th, 2017, Lobo – Cenizo line outage and Plant 1 and 2 tripped

Case 3: October 27th, 2017, Del Sol – Pomelo line outage and no WGR trip



Source:

http://www.ercot.com/content/wcm/key_documents_lists/139265/10_South_Texas_SSR_ERCOT_ROS_May_2018_rev1.pdf

Aug. 24th, WGRs Tripped Due to SSR



SSCI started after WGRs became radially connected to series capacitors

Today's urgent power grid needs

NERC
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

1,200 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report

Southern California 8/16/2016 Event

June 2017

NERC
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

900 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report

Southern California Event: October 9, 2017
Joint NERC and WECC Staff Report

February 2018

Reflected in job market ...

- IBR grid integration related engineering positions
 - Knowledge of all three subareas: **power grid, inverters, wind turbine (induction machines)**
 - Utility engineers capable of **PSCAD**
 - Protection engineers capable of **PSCAD**
 - Researchers capable of advanced computing: python programming, optimization, simulation, etc.

M.S. Curriculum Design

- 5 courses designed based on the skills required by the job market
 - Power grid operation fundamentals (**Power System Analysis, PSII**)
 - High inverter penetration (**power electronics, energy delivery systems**)
 - Wind (**Electric machines and drives**)

Fall 2019

- Power System Analysis
 - Steady-state computing, fault analysis considering IBR penetration
 - MATLAB, Python, PSCAD
- AC Machines and Drives
 - Wind energy system dynamics and control
 - Model building using Matlab/Simulink
 - PSCAD

Information and resource

- Please check power.eng.usf.edu
 - R&D News
 - Pics
 - Publications



Appendix

Student success stories

- Ph.D. students
 - Industry:
 - Consulting: **EATON, ACLARA, GE, Alstom, ABB, PWR solutions,**
 - Utilities: **South Edison California, ONCOR** (Texas Austin)
 - Academic:
 - Penn State Harrisburg (Assistant Professor)
 - U. of Tennessee Chattanooga (Assistant Professor)

Past students & job placement

PH.D. graduates

- Hossein Ghasempour, Ph.D. Dec. 2016, **Eaton**, Minneapolis
- Javad Khazaei, Ph.D. July 2016, **Penn State Harrisburg**, Assistant Professor
- Lakshan Piyasinghe, Ph.D. Dec. 2015, **Aclara**, St. Louis.
- Ling Xu, Ph.D. awarded in Dec. 2013, **Alstom Grid R&D, GE, South Edison (LA, California)**
- Yasser Wehbe, Ph.D. awarded in Dec. 2012, **ABB**, Texas
- Haiping Yin, Ph.D. Dec. 2011, **PwrSolutions/Oncor**, Texas Austin
- Vahid Disfani, Ph.D. Aug. 2015, Postdoc at **UC. San Diego**, Assistant Professor at **U. of Tennessee Chattanooga**

Master graduates

- Nenad Damjanovic, Master, **Black & Veatch**
- Ann Balter, Master, **SEL**

MS Students



Vaibhav Bilagi, E.I.T. • 1st

Transmission Engineer at E.ON Climate & Renewables North America, LLC

Austin, Texas

Message

More...



E.ON Climate & Renewables
North America, LLC



University of South Florida



See contact info



See connections (235)

"One Unit of Energy saved is worth two generated!" • EIT certified graduate Engineer with Master's in Electrical Engineering (Major: Power and Energy Systems) from University of South Florida, Tampa. • 2 years of professional experience as Systems Engineer at Infosys Limited, Bangalore, India with excellent ...

Experience



Transmission Engineer

E.ON Climate & Renewables North America, LLC

Jul 2018 – Present · 2 mos

Austin, Texas Area

Education



University of South Florida

Master of Science - MS, Power and Energy Systems

2016 – 2018



Siddaganga Institute of Technology, TUMKUR

Bachelor of Engineering - BE, Electrical and Electronics Engineering

2010 – 2014

M.S. Students

Sreeram Murali, a master student graduated in May 2016, got three job offers.



Sreeram Murali

Electrical Engineer at Dynamic Energy

Greater Philadelphia Area

| Electrical/Electronic Manufacturing

500+
connections

Current	Dynamic Energy
Previous	Bosch Engineering and Business Solutions, Larsen & Toubro Power
Education	University of South Florida
Recommendations	2 people have recommended

Summary

An Entry Level Electrical Engineer seeking Full time opportunities in Power Systems and Renewable Energy Industry.

Technical Specifications

Tools: MATLAB, Simulink, SimPowersystems, AutoCAD, SKM, PSCAD, PVsyst, ETAP(Basics), Arduino, Microsoft Office, MI-power, MATPOWER, CVX, Microstation.

Languages: Basics of C, Embedded C.

Education

University of South Florida

Master's Degree, Electrical Engineering- Powersystems and Renewable Energy Engineering

2015 – 2016

Activities and Societies: Students of Indian Association, USF Mens Volleyball Club, ISES, IEEE-PES- Member

Sri Bhagawan Mahaveer Jain College

Engineer's Degree, Electrical and Electronics Engineering, A

2010 – 2014

Activities and Societies: 1. "Recruitment Coordinator" for Electrical and Electronics Engineering Department (EEE), 2. "Main Technical Member" of EEE Department Club SPARKS, 3. Represented student body as "Student Council leader" and negotiated their needs with school management.





2nd

Shibali Malla

- M.S. program 2016-2017
- LCG consulting energy online (LA California)

NEW RELEASES

Generator X
Generation & Transmission
Expansion

UPLAN-ACE
Real-Time Market Simulator

UPLAN-NPM
Release 10.0.0

PRESS RELEASE

ERCOT 2017 Summer Quarter
Outlook

LCG, July 13, 2017-- Earlier this
year LCG Consulting published
two quarterly reports, January –
March, 2017 and March – May
2017, looking at how the ERCOT
grid can cope with strained
network conditions. LCG just
released a new report that
covers the analysis for the 2017
summer season (June through
September). Extreme loading is
a key factor in considering
resource adequacy for the region
during summer season.

[Read more](#)

What can ERCOT expect in
2017? Two new studies
published

LCG, February 27, 2017--LCG
Consulting has published two
reports using its premiere grid

NEWS

EIA Forecasts Continued Increase in U.S.
Natural Gas Exports

LCG, August 10, 2017--The U.S. Energy
Information Administration (EIA) released
earlier this week its Short-Term Energy
Outlook that forecasts the nation will export
more natural gas than it imports in 2017 and
throughout 2018. Furthermore, the EIA
projects the U.S. will continue to be a net
exporter beyond 2018 because of growing
U.S. natural gas exports to Mexico, declining
pipeline imports from Canada, and increasing
exports of liquefied natural gas (LNG).

[Read more](#)

New Legislation Proposed in U.S. Senate
for Offshore Wind ITC

MARKETS

Energy Market Forecasts
and Actuals

MarketVision Forecasts
CAISO Sep 2017

Energy Price (Actuals)	
ERCOT	\$26.51
MISO	\$36.94
NYISO	\$24.87
NEISO	\$18.36
CAISO	\$23.1
PJM	\$47

Load (Actuals)

ERCOT	64912 MW
MISO	96116 MW
NYISO	23911 MW
NEISO	17698 MW
CAISO	26524 MW

PRODUCTS

Generator X
Generation and
Transmission Planning
and Optimization

UPLAN-NPM
The Locational Marginal
Price Model (LMP)
Network Power Model

UPLAN-ACE
Day Ahead and Real Time
Market Simulation

PowerMax
Day-ahead and real-time
portfolio revenue
optimization

UPLAN-G
The Gas Procurement and
Competitive Analysis
System

PLATO
Database of Plants,
Loads, Assets,
Transmission...

SERVICES

MarketWatch
Monthly summary of
prices, congestion and
important events in
ERCOT

CAISO CRR
Auctions
Monthly Price and
Congestion Forecasting
Service

Skills benefited job hunting:

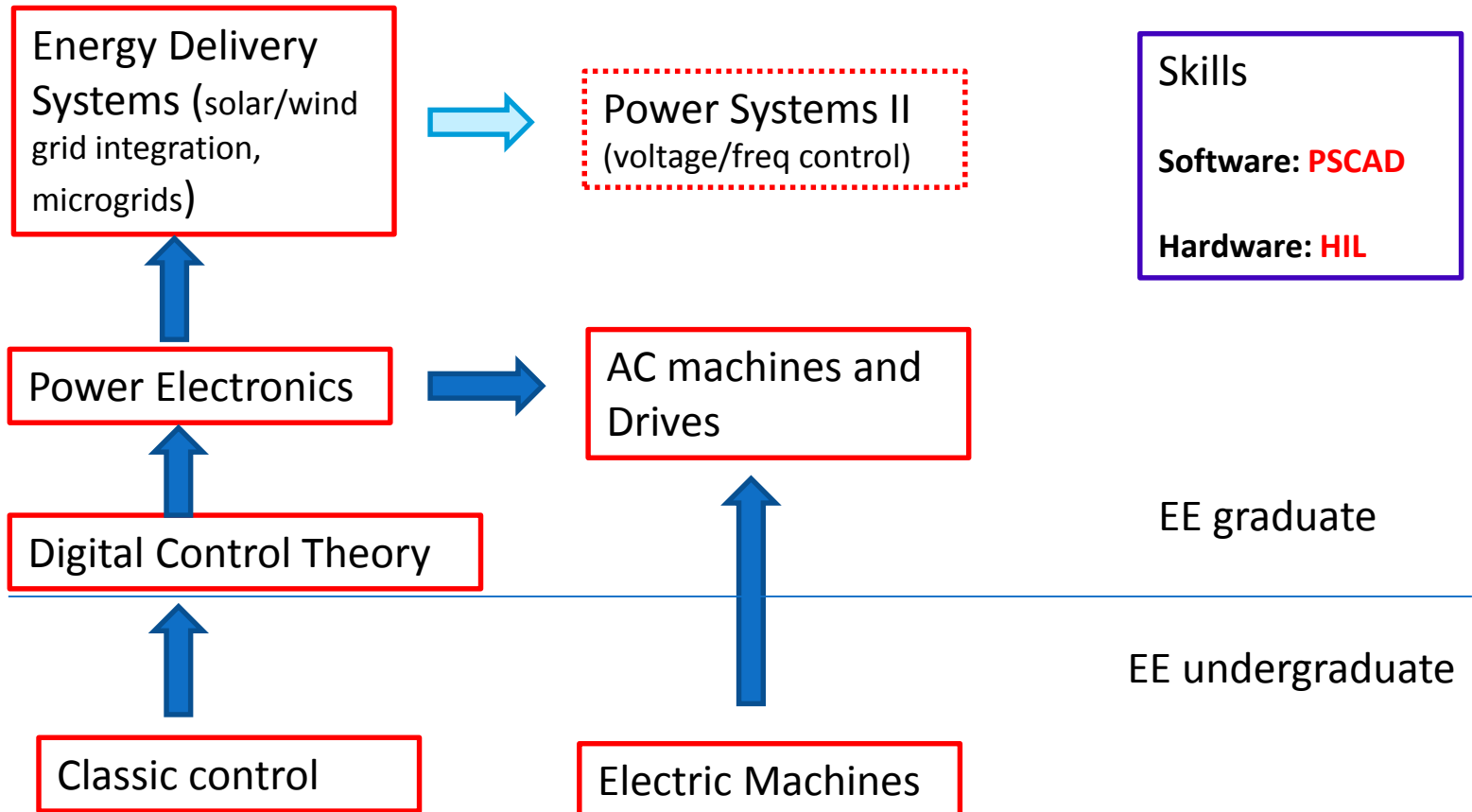
Power System Analysis, Optimization
Python
concepts on Power Market



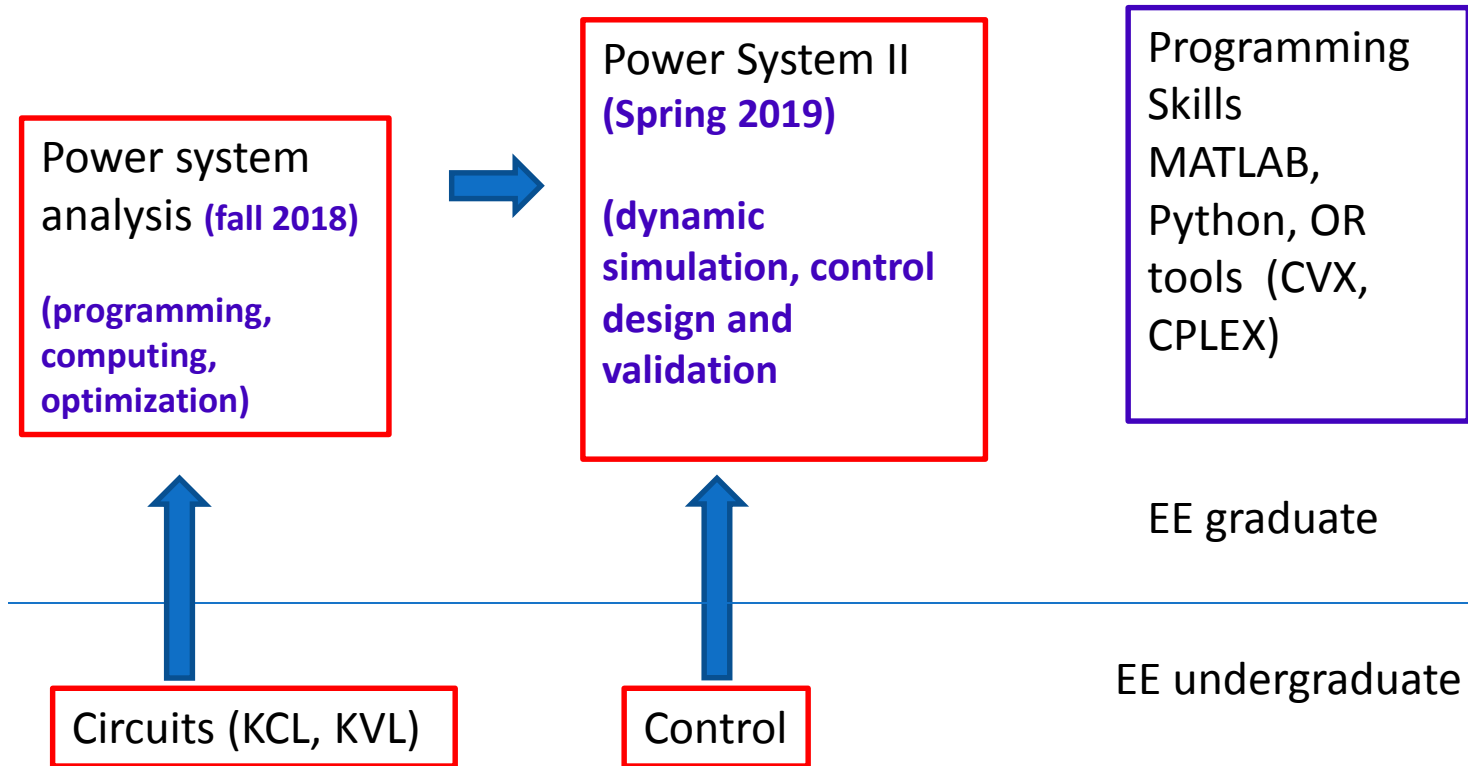
Sayed A. Sadat

- M.S. student Aug. 2015-May 2017
- Published a paper to IEEE PES GM 2017
- Received two Ph.D. offers from U. of Melbourne and U. of Utah

Track 1: Renewable energy grid integration



Track 2: Power System Operation

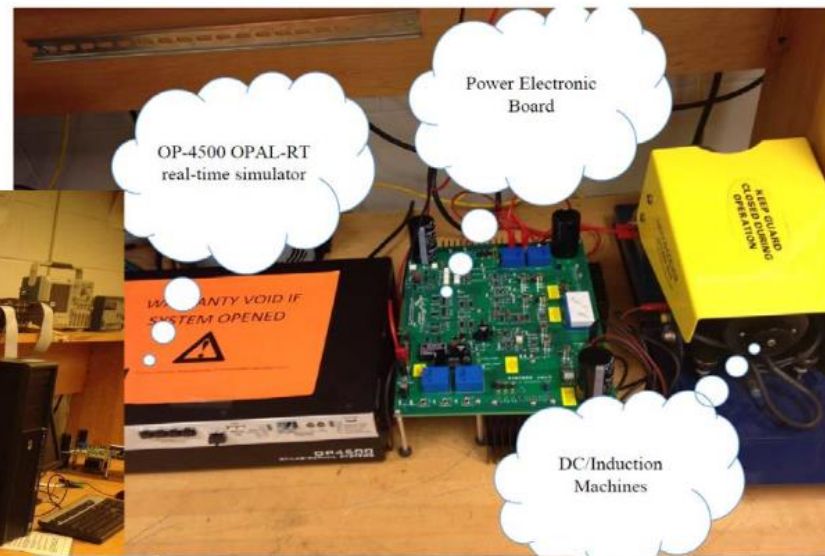
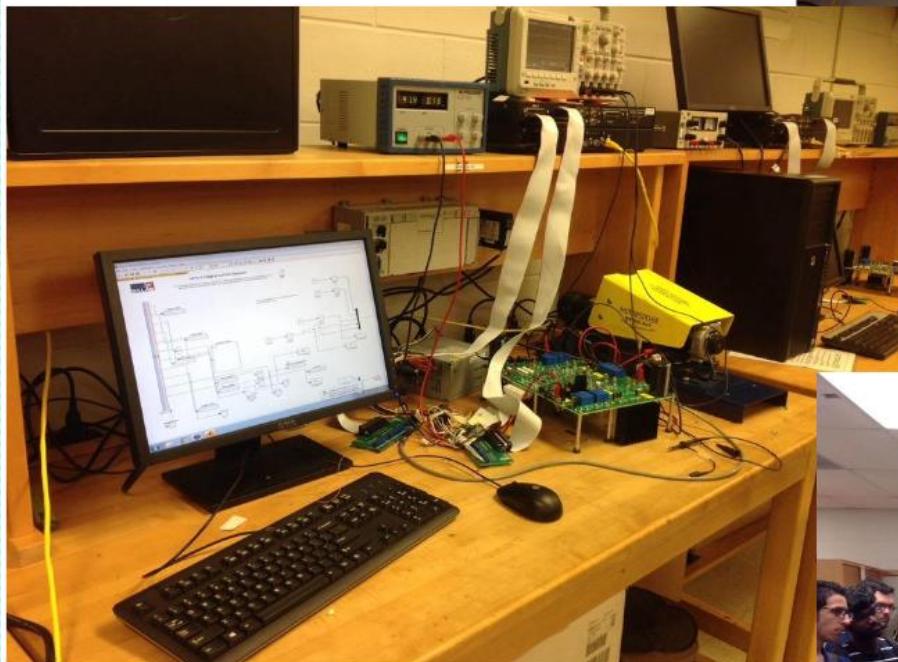


Power program features

- **Excellent curriculum** that prepares students with computer-aid analysis and design skills: software and hardware
 - Software training (**PSCAD**) in power systems & power electronics courses
 - Programming and software training (**Matlab, Python, OR tools**) in power systems & power market
 - Hardware training in machine and control courses (**RT-Lab, HIL**)
- **Excellent teaching lab/facility**
 - **Opal-RT** real-time simulators enabled Hardware-in-the-loop (HIL) testbed

<http://www.floridaenergy.ufl.edu/wp-content/uploads/9-FanLingling.pdf>

RT-LAB Enabled Drive Lab



USF Smart Grid Power Systems Lab

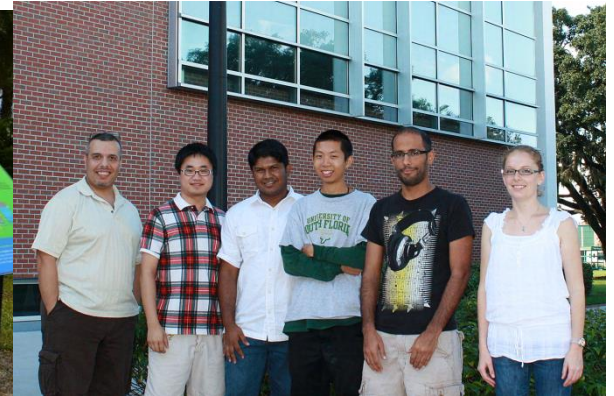
<http://power.eng.usf.edu>



Lab location



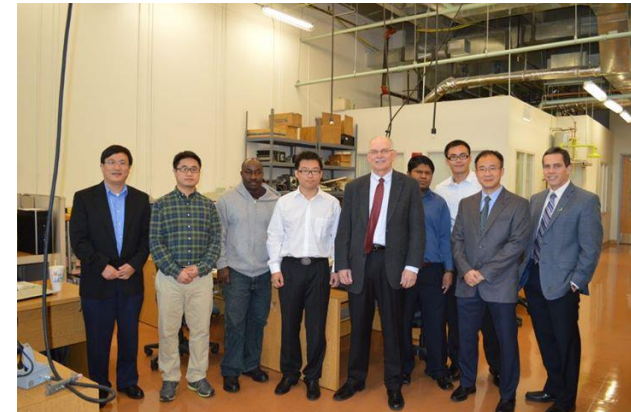
PV/battery live laboratory



students



Oct. 2015 Lakshan's defense



Prof. Poor's (COE Dean of Princeton) visit



Thank you!

Contact information

Lingling Fan

4202 E Fowler Ave. ENB 118

Tampa FL 33620

linglingfan@usf.edu

(813)974-2031

<http://power.eng.usf.edu>