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 Solar

Electric Machines
- Wind industry
  - Siemens Gameasa
  - Vestas
  - GE Wind Power
- Electric Vehicle industry
  - Tesla
Today’s grid: high penetration of inverter-based resources

Photovoltaic Solar Resource: Flat Plate Tilted South at Latitude

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

Source: NERC
• Wind penetration record – 56% on Jan. 19, 2019 at 3:10 a.m.

Wind Capacity by Year
cumulative totals
2010 to 2019

Source:
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:
Aug. 24th, WGRs Tripped Due to SSR

SSCI started after WGRs became radially connected to series capacitors
Today’s urgent power grid needs

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

Southern California 8/16/2016 Event

June 2017

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 Damnjanovic, Master, Black & Veatch
- Ann Balter, Master, SEL
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
Sreeram Murali, a master student graduated in May 2016, got three job offers.

**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.

**University of South Florida**

Master's Degree, Electrical Engineering - Power Systems 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**

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

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

Energy Delivery Systems (solar/wind grid integration, microgrids)

Power Electronics

Digital Control Theory

Classic control

AC machines and Drives

Power Systems II (voltage/freq control)

Electric Machines

Skills
Software: PSCAD
Hardware: HIL

EE undergraduate
EE graduate

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Track 2: Power System Operation

Power system analysis (fall 2018) (programming, computing, optimization)

Power System II (Spring 2019) (dynamic simulation, control design and validation)

Circuits (KCL, KVL)

Control

Programming Skills
MATLAB, Python, OR tools (CVX, CPLEX)

EE graduate

EE undergraduate

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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
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

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Thank you!

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