Hunter Blake Estes

Graduate Student, NSF-IGERT Fellow

http://research.engr.utexas.edu/igertsustainablegrids/

Focus: **Energy & Power Systems**

Research Advisors:

Dr. Alexis Kwasinski & Dr. Robert Hebner

Research Group: Center for Electromechanics

http://www.utexas.edu/research/cem/dcmicrogridfaultexperiments.html

- **The University of Texas at Austin**
  Department of Electrical & Computer Engineering
  graduate work (24 hrs)
  undergraduate work (46 hrs) – *no degree sought*
- **7+ years Semiconductor Industry**
  Diffusion Process & Integration engineer
  (AMD, Honeywell, STMicroelectronics)
- **The University of Texas at Austin**
  Department of Chemical Engineering (BS – Dec.'97)

PUBLICATIONS

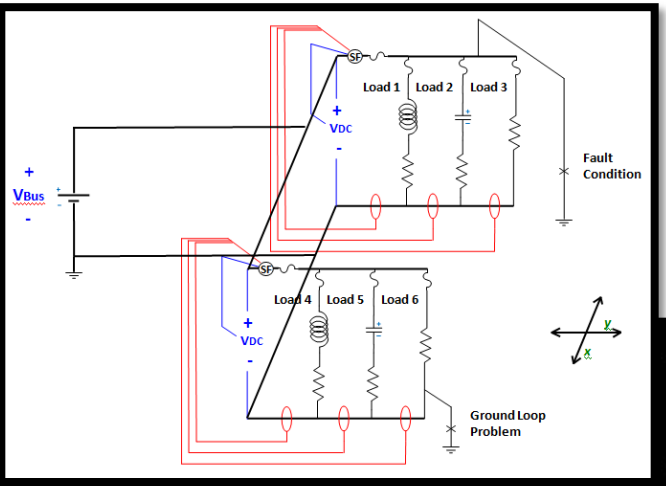
- **Masters Thesis** *(in review)*: ***"Open Series Fault Comparison in AC & DC Micro-grid Architectures",*** The University of Texas, Dept. of Electrical & Computer Engineering – Dr. Kwasinski & Dr. Hebner
- **Conf. Paper**: *"Open Series Fault Comparison in AC & DC Micro-grid Architectures"*, **primary author**, The International Telecommunications Energy Conference (INTELEC) 2011 – Amsterdam, The Netherlands
- **Conf. Paper**: *"Development of a Series Fault Model for DC Micro-grids"*, **co-author**, PES Innovative Smart Grid Technologies Conference 2012 – Washington, D.C., USA
- **Conf. Presentation:** *"DC Open Series Fault Considerations for Distributed Generation µGrid Architecture"*, **sole presenter**, Electric Ship Technologies Symposium (ESTS) 2011 – Alexandria, VA, USA

RESEARCH AWARDS, GRANTS, & FUNDING

- National Science Foundation (NSF) – IGERT Graduate Fellow / Trainee – *Fall '10 – Spring '12* *(http://research.engr.utexas.edu/igertsustainablegrids/)*
  - Internship – Technische Universität München – Munich, Germany – *Summer '11*
  - Graduate Researcher – Pecan Street, Inc. – Austin, TX *(http://www.pecanstreet.org/)*
- Al F. Tasch, Jr. Memorial Endowed Graduate Fellowship – UT Austin, Dept. of ECE, – *Fall '10-Spring '11*
- Graduate Research Assistant – Dr. Hebner – UT Austin, Center for Electromechanics – *Fall '10 - current*

UNIVERSITY OF TEXAS AT AUSTIN
UT ECE
ELECTRICAL & COMPUTER ENGINEERING

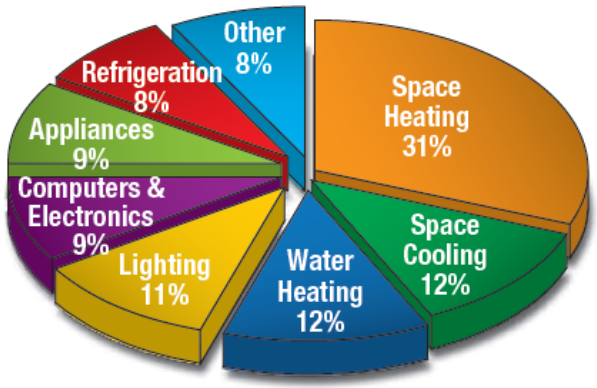
- With the recent interest in smart grid technology, active power management, distributed generation, energy storage, etc., DC architectures are gaining more attention. Especially if power is generated locally, or does not have to travel far from source to load. *(old Tesla & Westinghouse vs. Edison debate, revisited?)*
- Many Distributed Generation **resources** generate in DC:
  - *solar PV arrays, fuel cells, microturbines, **batteries**, ultracapacitors, rectified wind systems*
- Many **loads** are, or can be DC-based:
  - *LEDs, computers & electronics, appliances, electric heating, AC compressor induction motors can be replaced by DC brush(less) motors, **EVs**, etc.*
- **Advanced Power Electronics** now allow for DC-DC conversions, as well as some branch isolation techniques *(something not available 100 years ago)*
- However, with the lack of a periodic zero-crossing, the biggest concern with DC systems is what happens during a **fault** condition. *(i.e. **safety considerations**)*
- Research topic is therefore on DC micro-grids with a particular emphasis on **open series fault formations** & their **effects** on localized grid



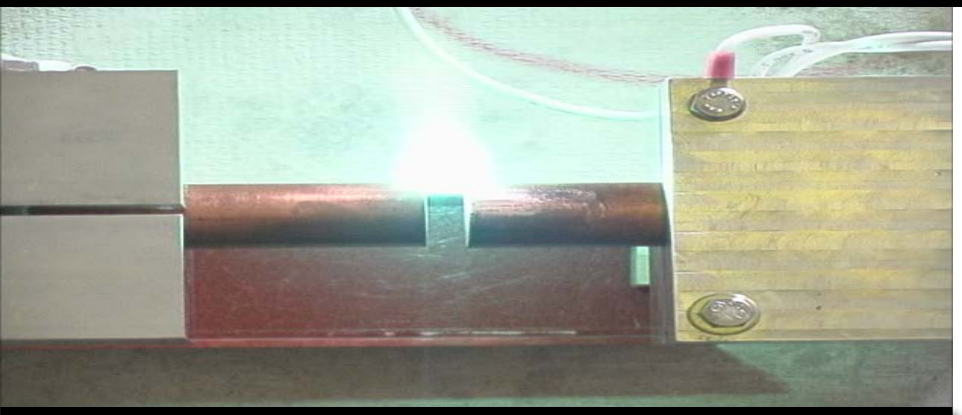
Hunter Blake Estes

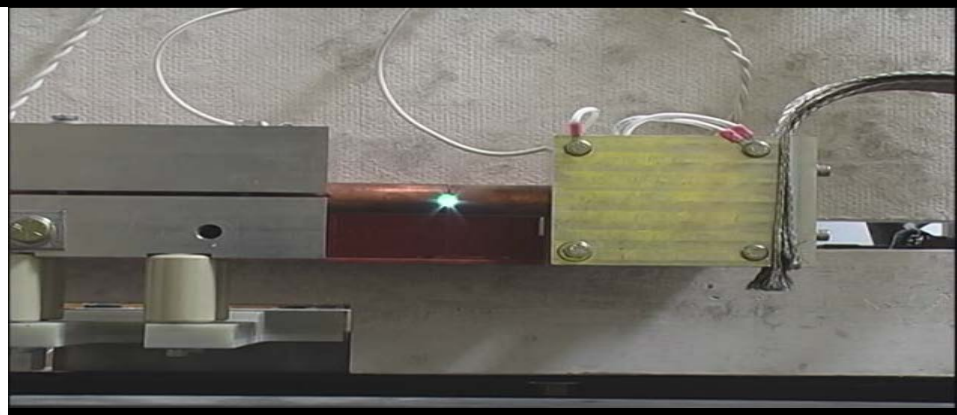
Graduate Research Topic

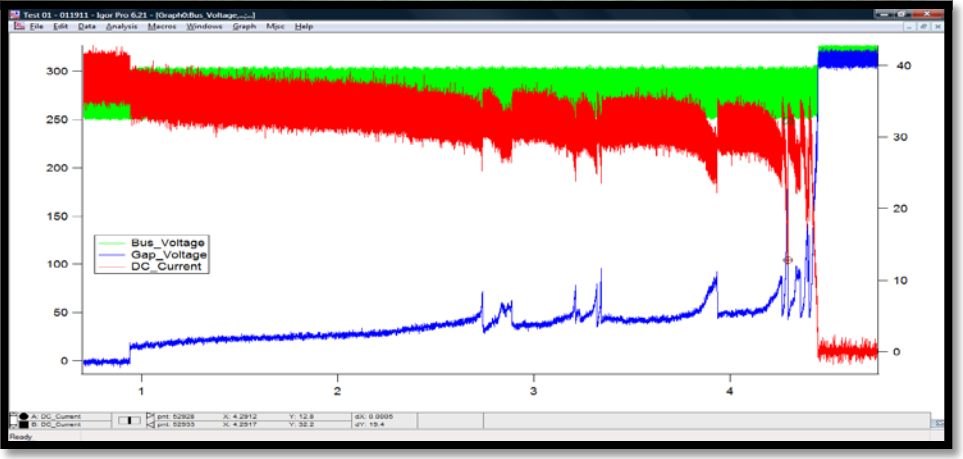
UNIVERSITY OF TEXAS AT AUSTIN
UT ECE
ELECTRICAL & COMPUTER ENGINEERING

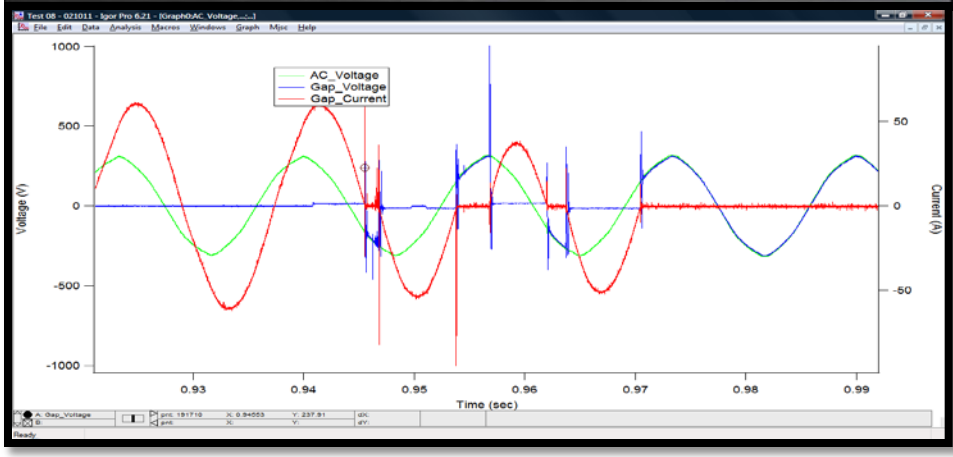


How We Use Energy in Our Homes









DC open series fault transients

AC open series fault transients

- **Experimental approach** by 1st building a **µGrid**:
  - *3φ AC source panel → variac or transformer → passive 6 diode bridge rectifier (DBR) → "open series fault" → R-L load*
  - DC *(280 – 635V)* vs. AC systems of "*quasi-equivalent*" parameters
- **Monitor:** currents, gap voltages, arc fault transients, power dissipated, bus disturbances, duration, re-strikes, & impedance effects *(50 to 5 µs data capture rates, 12 bit resolution)*
- **Model:** DC arc transient effects, grid propagation of these disturbances, etc.
- **Suggest:** DC breaker designs, DC architecture fault clearing strategies, safety recommendations
- **Further Study:** DC positive voltage single line-to-ground faults, ground loop faults, etc.