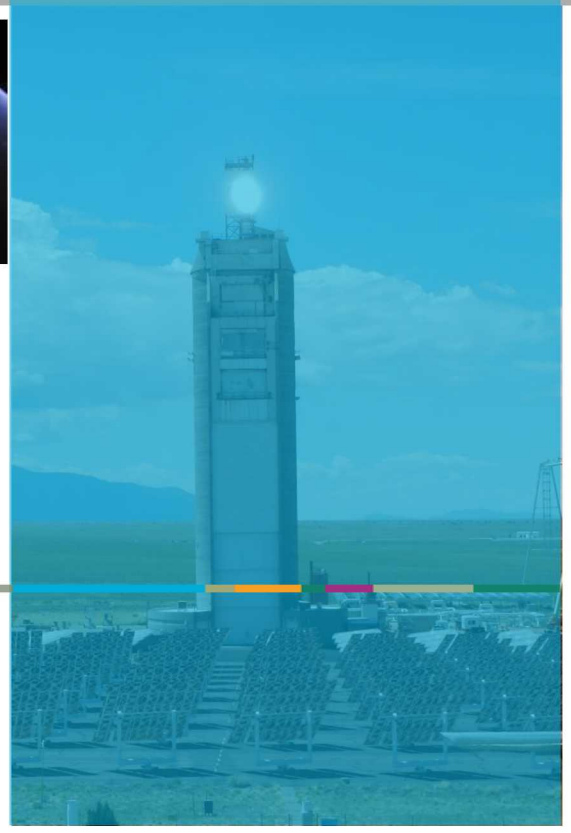
Sandia National Laboratories

SAND2020-5131PE

Renewable Energy and Resilience







PRESENTED BY

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Principal Member of Technical Staff
Renewable & Distributed System Integration

UPRM/Sandia Webinar on Research Synergies

May 21, 2020

U.S. DEPARTMENT OF ENERGY | NNSA

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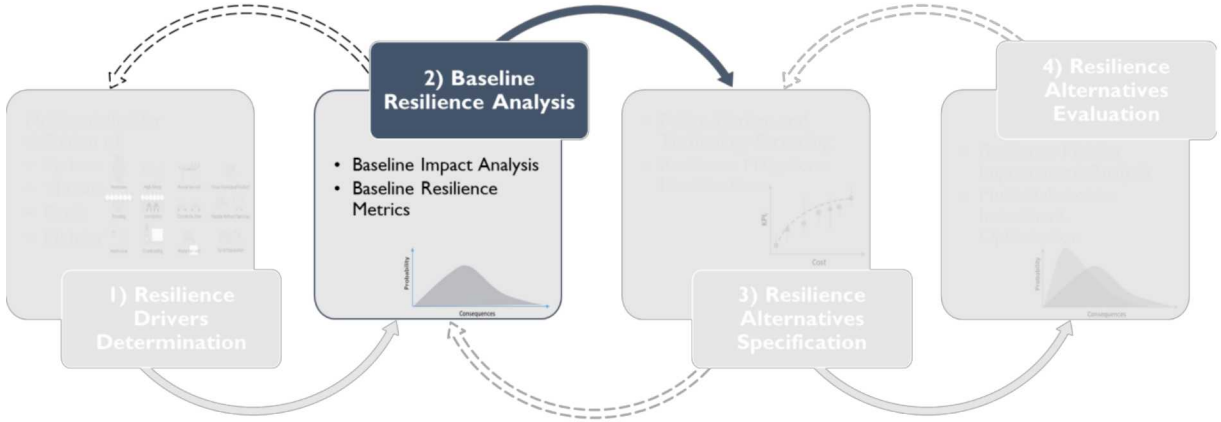
Summary of my Work at Sandia

- PV hosting capacity analysis (OpenDSS, GridPV)
- DG challenges in remote/islanded systems
- EVs in remote/islanded systems
- Resilient power solutions for end of line communities (Gridlab-D)
- Energy resilience
  - PTS – Identify research directions; connecting Sandians & UPRM researchers
  - Designing Resilient Communities (MDT)

Initial Baseline Resilience Analysis

Baseline metrics:

- Efficiency/Affordability
  - **Average bills for residential and commercial customers**
    - No tiered rates
    - Yes to net metering
    - Flat rate for public housing
- Sustainability
  - **GHG Emissions**
    - Estimated average 1.25 lbs CO2e per kWh for 2018
  - **Fraction of power from renewable sources**
    - Estimate amount of local PV installed + capacity factor
  - **Lifecycle impacts**
    - End of life challenges – no current plan for PV/battery recycling
- Resilience
  - **Social Burden to acquire services**
    - Sandia modeling methodology + U-Buffalo validation



Average in cents/kWh for the three main class rates
(source: EIA, Electric Power Monthly, December 2019)

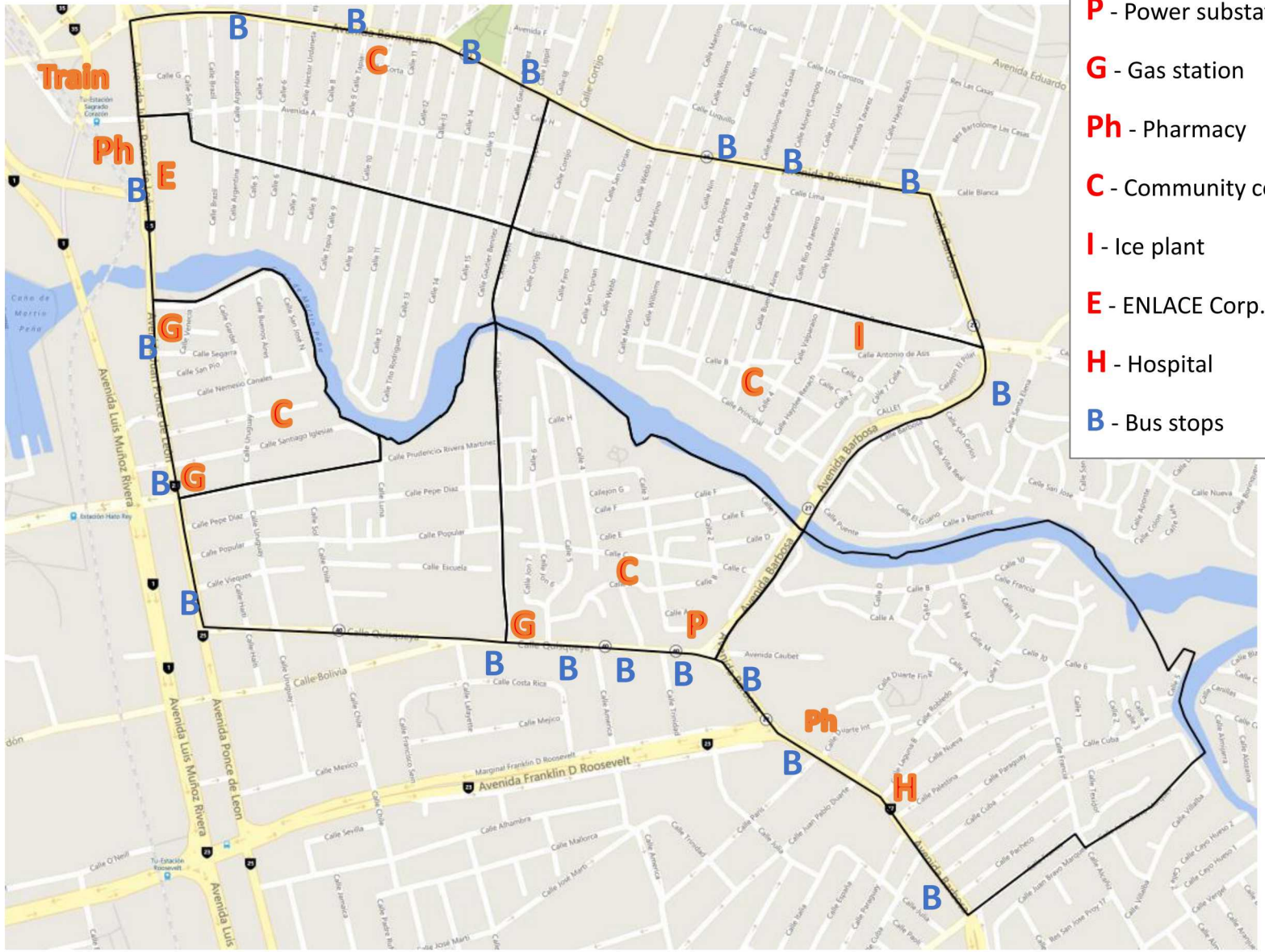
Year	Residential	Commercial	Industrial
2016	17.93	19.57	15.83
2017 (María)	22.26	22.72	19.70
2018	20.73	23.08	19.04

From Sandia presentation during
GMLC DRC SAG Meeting 4 (1/2020)

Infrastructure Around the Communities

Some infrastructure available:

- Three gas stations
- One electric power distribution substation (38kV/4.16kV, 11MVA)
- One hospital
- Two pharmacies
- One ice plant in the community
- Eleven grocery stores (most of them are small convenient stores)
- Five community centers
- Bus stops around the perimeter of the seven communities
- Train station nearby (not usable in a power outage)

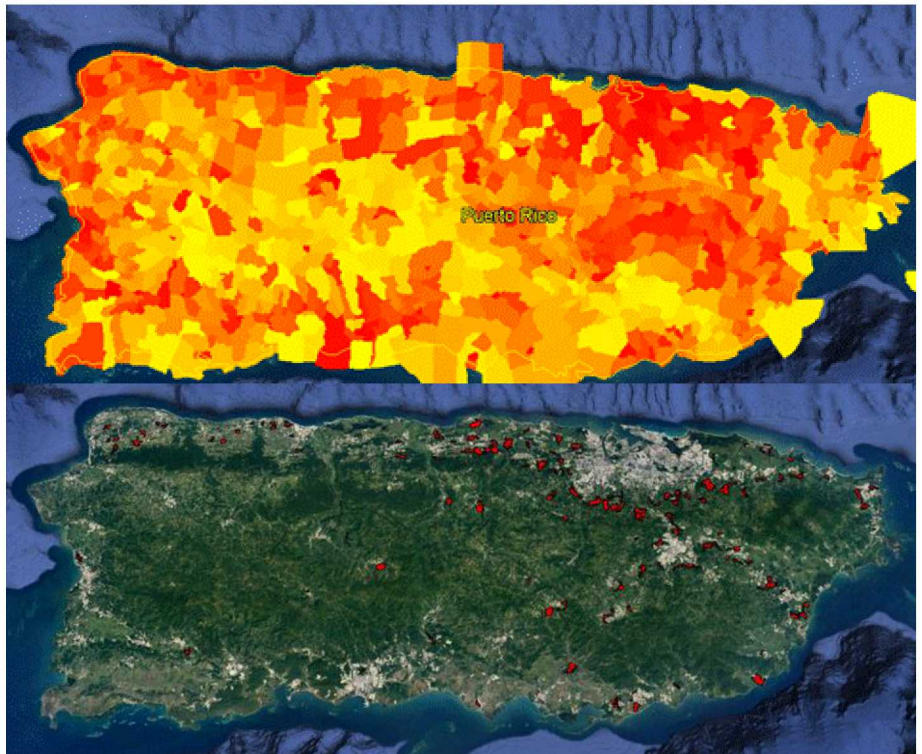


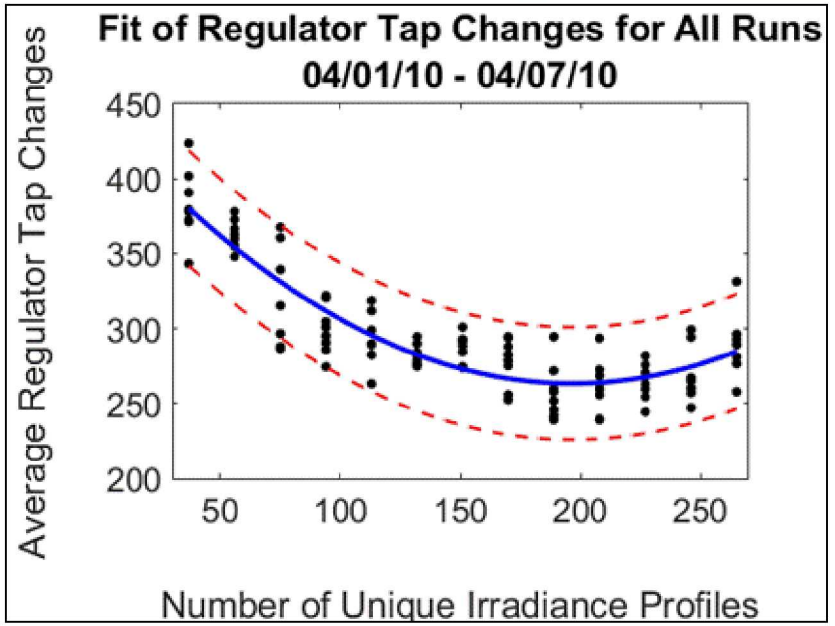
Original Image Credit: ENLACE project corporation

From Sandia presentation during GMLC DRC SAG Meeting 4 (1/2020)

Intern Experiences: Melvin Lugo

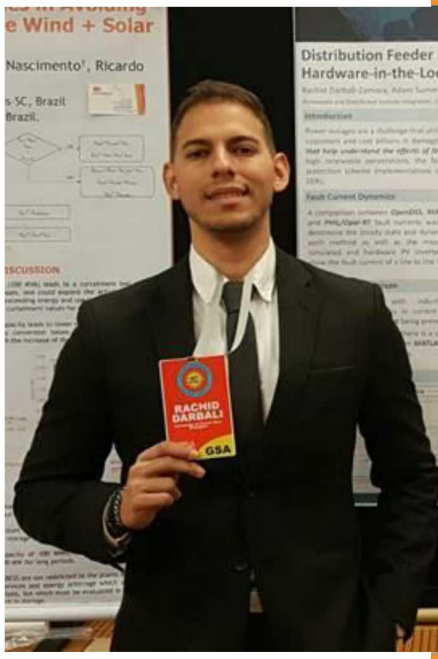
- MSEE student, University of Puerto Rico-Mayaguez (UPRM)
- Internship at Sandia: Summer 2018 (10 weeks) and June to October 2019
- Research topics: irradiance profile variability from clouds, microgrid and load selection based on severe blackouts
- MS thesis based on Sandia work

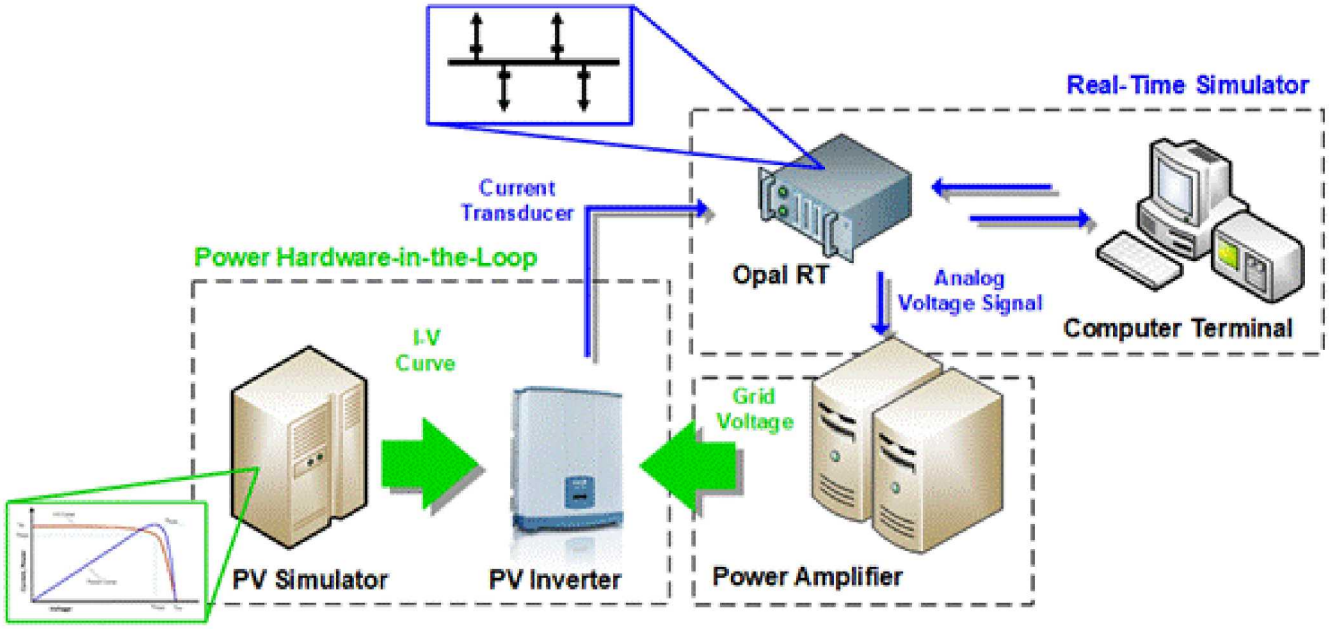


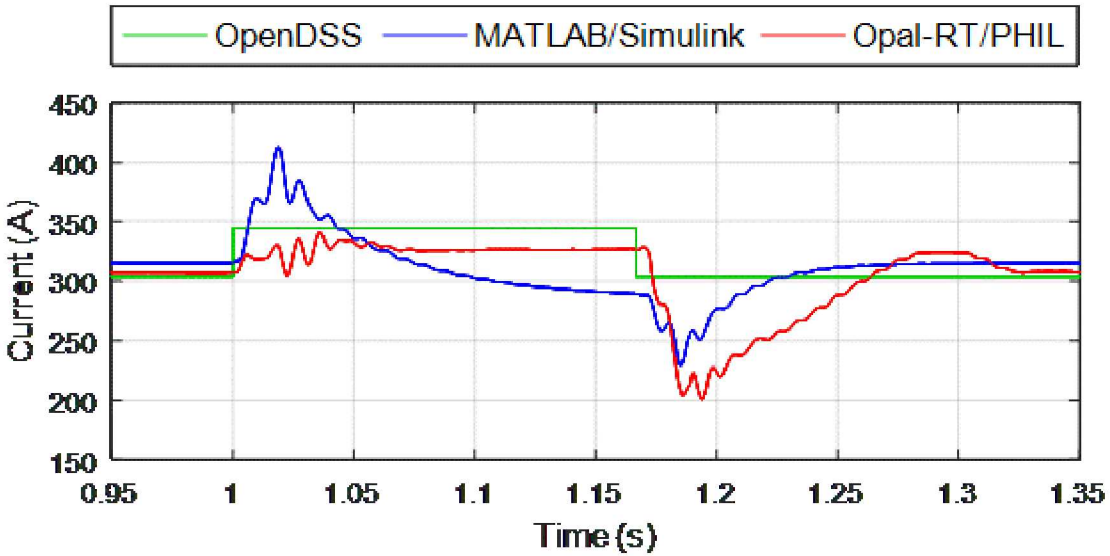


Intern Experiences: Rachid Darbali

- PhD student, EE, University of Puerto Rico-Mayaguez (UPRM)
- Internships at Sandia: Summer 2017 & 2018, Year Round 2019 ***(now MOW)***
- Research topics: Power Hardware-in-the-Loop, cybersecurity, power electronics, protection systems, resilience
- Papers in IEEE Journal of Photovoltaics, IEEE World Conference on Photovoltaic Energy Conversion, IEEE Photovoltaic Specialists Conference & IEEE Andean Council International Conference







Q & A

Back-up slides

FROM PUBLIC WEBSITE
https://www.sandia.gov/careers/students_postdocs/internships/index.html

An internship with real-world application (Internships & Co-ops)

- Students from around the country—from those in their final years of high school to researchers obtaining PhDs— work in a variety of technical and business positions. Interns work on real-world, challenging projects to contribute to critical national goals.
- A range of disciplines, including cyber security, energy surety, engineering design, and software development.
- Our internships provide students:
  - Opportunities to work on challenging projects at competitive pay
  - Academic credits for some co-op and other internships
  - Research mentoring from top scientists and engineers
  - Training and practical work experience using state-of-the-art equipment and instruments
- *In some cases, internships can also lead to an offer of full-time employment*.

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Internship Types

- Summer Internships are available to students at all education levels from all over the country, typically run 10-12 weeks. Summer interns may work up to 40 hours per week.
- Co-Op Internship conducted in partnership with individual schools, allow students to take time off during the academic year to gain work experience at Sandia, working up to 40 hours a week. These internships typically run 3–8 months during the academic term and may include an adjacent summer term.
- Year-Round Internships allow students who attend local schools to work part-time at a Sandia site.
- Academic Internship is a non-traditional internship is available to R&D or technical pipeline students who are attending a school with a track system or who have an alternative status that allows deferral of a term. Typically runs 3–5 months and may include an adjacent summer. Academic interns may work up to 40 hours per week.

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