

# Energy Harvesting, Storage and Management for Automated Environment Monitoring in the East African Region

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April Progress Report

## ...this month in brief...

Doha Presentation was a success. Left EBB on 10th April at 15:00 hrs. Arrived 11th April at 00:10 hrs. Attended Afternoon session, Gala dinner. Presented 12th April at 09:15 hrs. Attended conference tour. Visited a few places. Arrived 13th at 15:00 hrs

### Worth Noting

- Dr. William W. Anderson from University of Southern California who presented a paper on *Using Neural Networks to Model and Forecast Solar PV Power Generation at Isle of Eigg* His method would add some flesh to my Objective 3
- Dr. Ahmed Riadh Rebai, the ICT Project Manager at the Qatar National Research Fund who came in to see my session because of a shared interest and would like to get us in touch with some contacts in Tunisia
- Dr. Kasper M. Paasch - his PhD research gave me strong ideas to consider post-PhD

# Gallery



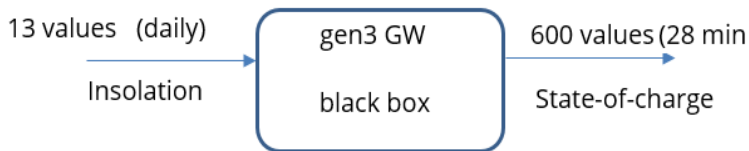
## Objective 2

Paper on LIC self-discharge is "complete" but I've decided to make one more run of the experiment using brand new capacitors (because 2 undergrad students are running a similar experiment on  $\text{LiFePO}_4$  and the test-bed is ready to deploy. Minimum effort)

## Objective 3

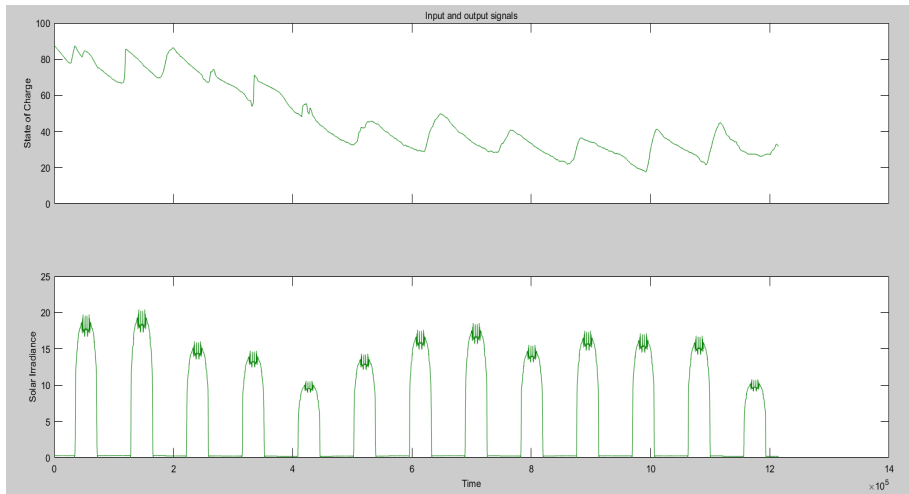
- Completed quick-start with MATLAB system identification toolbox
- Obtained 3 datasets from gen3 data. SOC and daily insolation data from Feb 16–28 (13 days) , Mar 12–20 (9 days), Mar 27–Apr 3 (8 days)

## Realizations and new knowledge - objective 3



- input solar insolation values are very few and completely hide short term sunshine variations through the day—which are actually responsible for the charge profile
- There is a need for higher-resolution (hourly) solar data. 2 solutions
  - use actual high resolution data. e.g. 10m node 🤖
  - use synthetic (modeled) data (re-analysis) - hourly insolation profile generated by algorithm from historic and /or current point data from current and / or other latitudes
    - Amillo et al (2014) - global model , Huld et al (2017) - global model
    - Gorjian et al (2012) - Tehran , Wan Nik et al (2011) - Malaysia

# sample input-output data



Linear Model:  $y_n = a_0t + a_1(t - 1) + a_2(t - 2)\dots + a_n(t - n)$

# May Plans

- Data pre-processing : point to point mapping gives better results
- Collect uninterrupted minutely insolation data: I will deploy another node dedicated to this. 10m is node running test firmware
- Select re-analysis algorithm to use
- Run preliminary validation (using same data)
- Really finish LIC paper and submit! No format required.
- Share dissertation format with supervisors