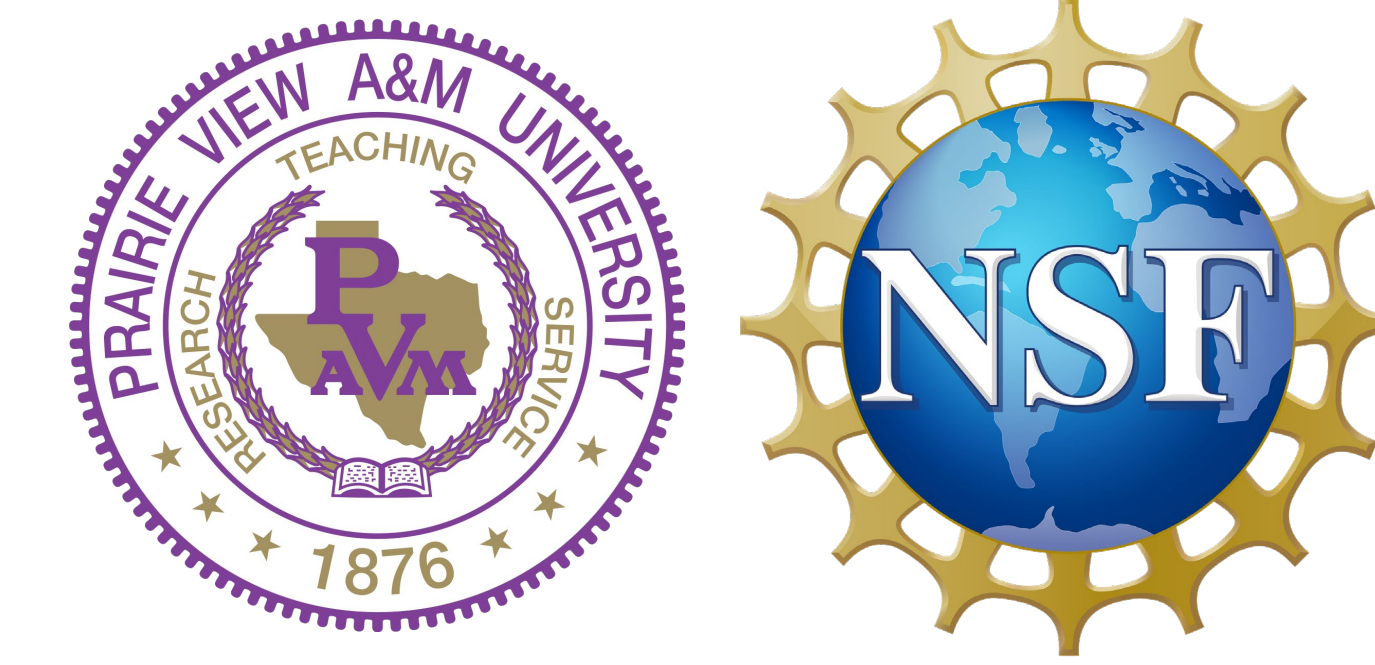
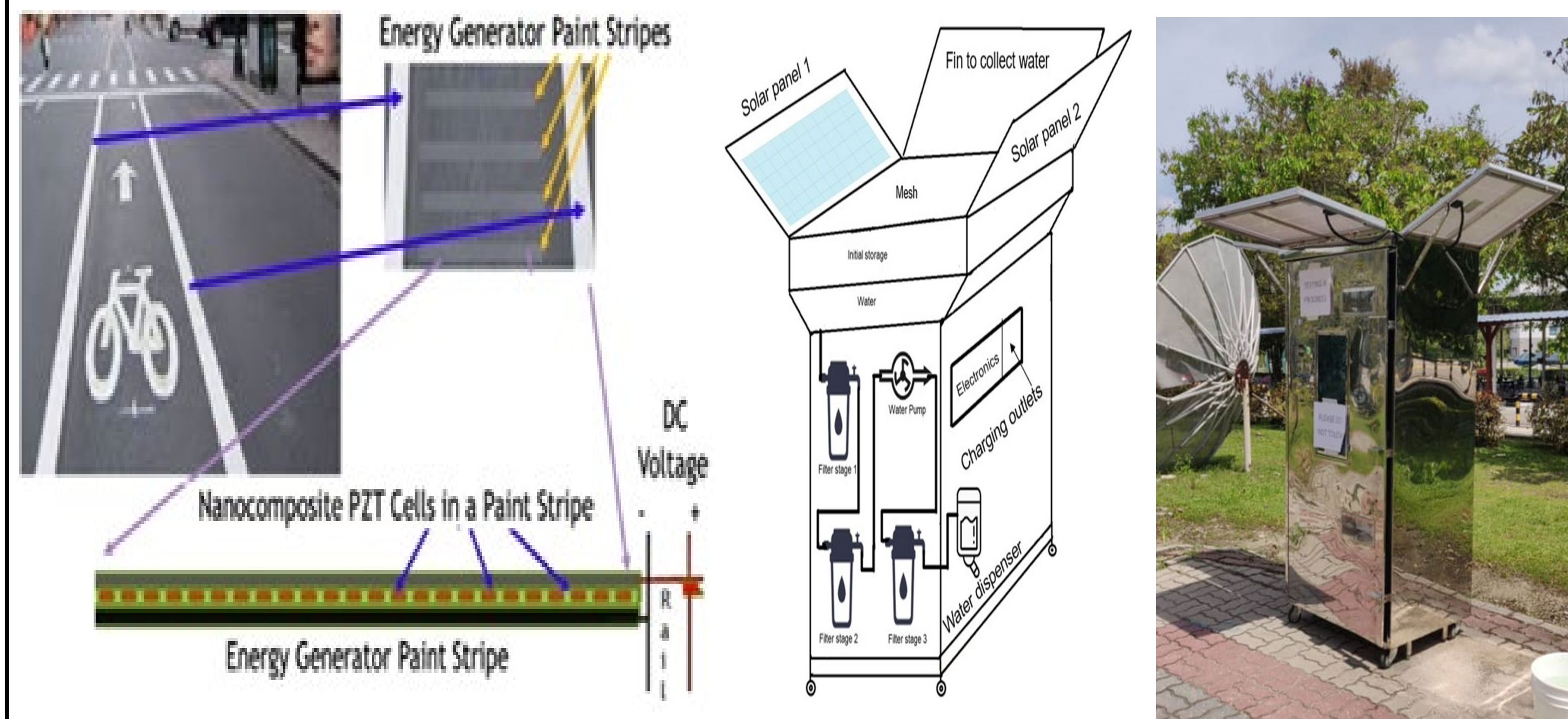


Sustainable Energy Bike Lanes with Applications in the City of Kuala Lumpur, Malaysia

Shuza Binzaid, Prairie View A&M University
Award Type: EAGER, [NSF Award ID-2025641]



Project Overview



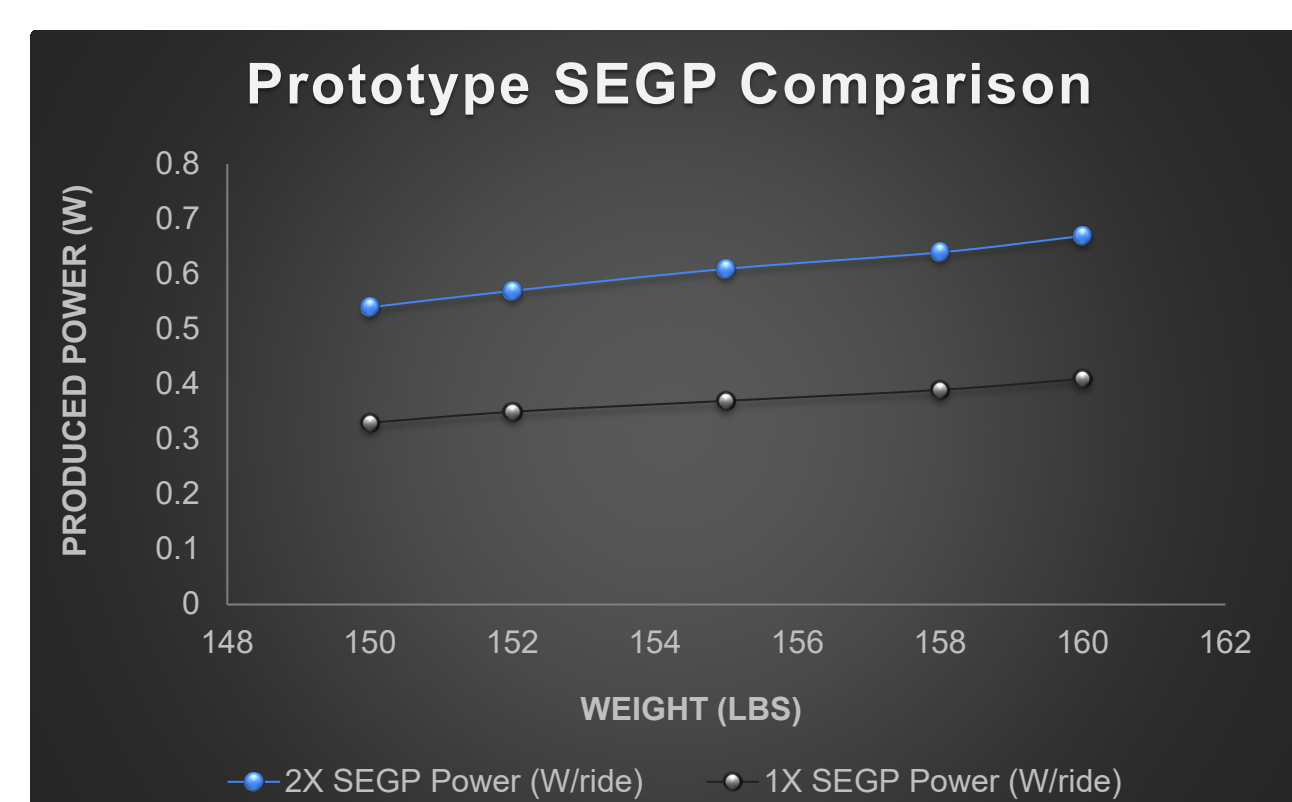
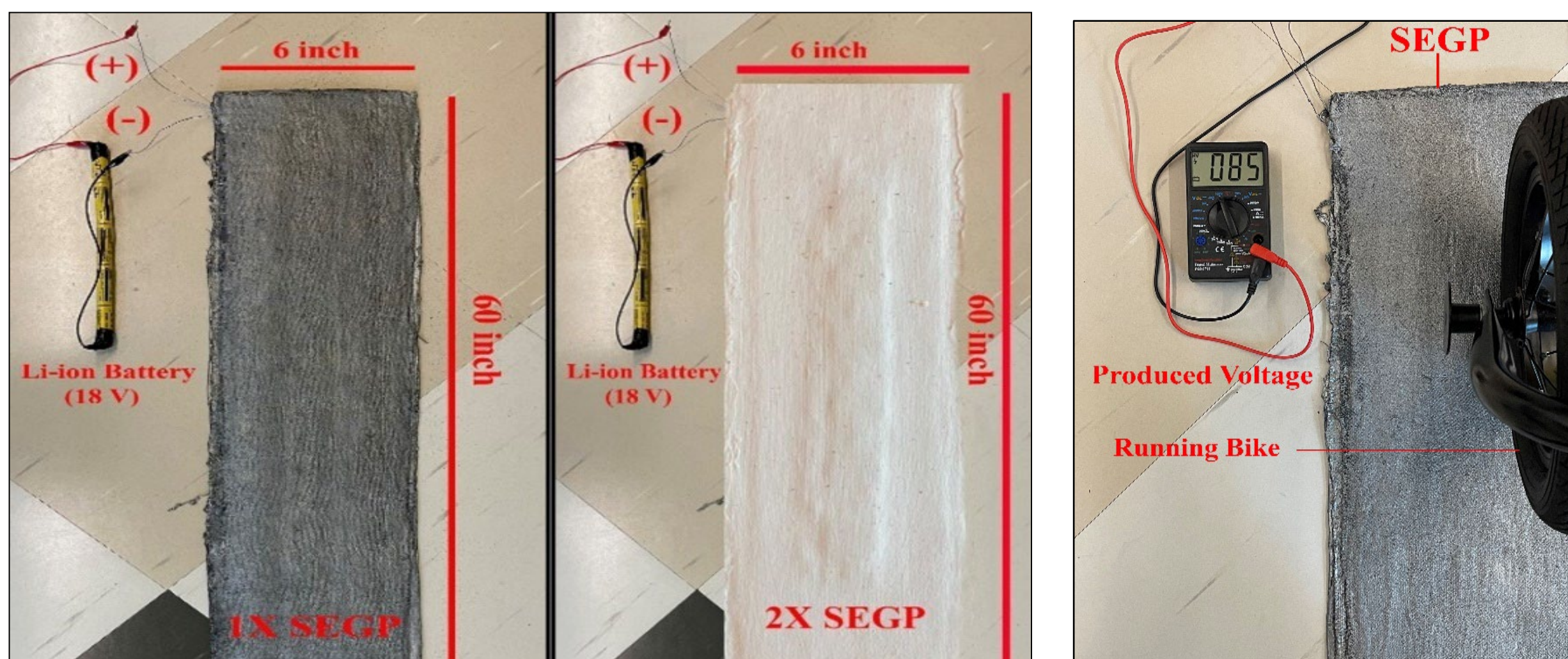
Project Challenge

- Hybridizing energy sources is crucial for newer renewable energy (RE) technology solutions with Solar PV and Energy Generating Pad (EGP) technology.
- A smart kiosk can collect rainwater and purify it for drinking using Hybrid Energy and Charging e-bikes.

Project Vision

- Kuala Lumpur city is growing rapidly by annexation and having dedicated 7 miles of bike lanes, now needing (a) green mobility targets, (b) sustainable energy, and © green lifestyles.
- The EGP technology transfer was made to UNITEN in 2022 but was halted by the departure of the faculty.
- PVAMU has successfully initiated another collaboration with Monash University Malaysia (MUM) with approval from Sunway City (KL).

Research Progress (Developed Process and Prototyped of Sustainable EGPs)



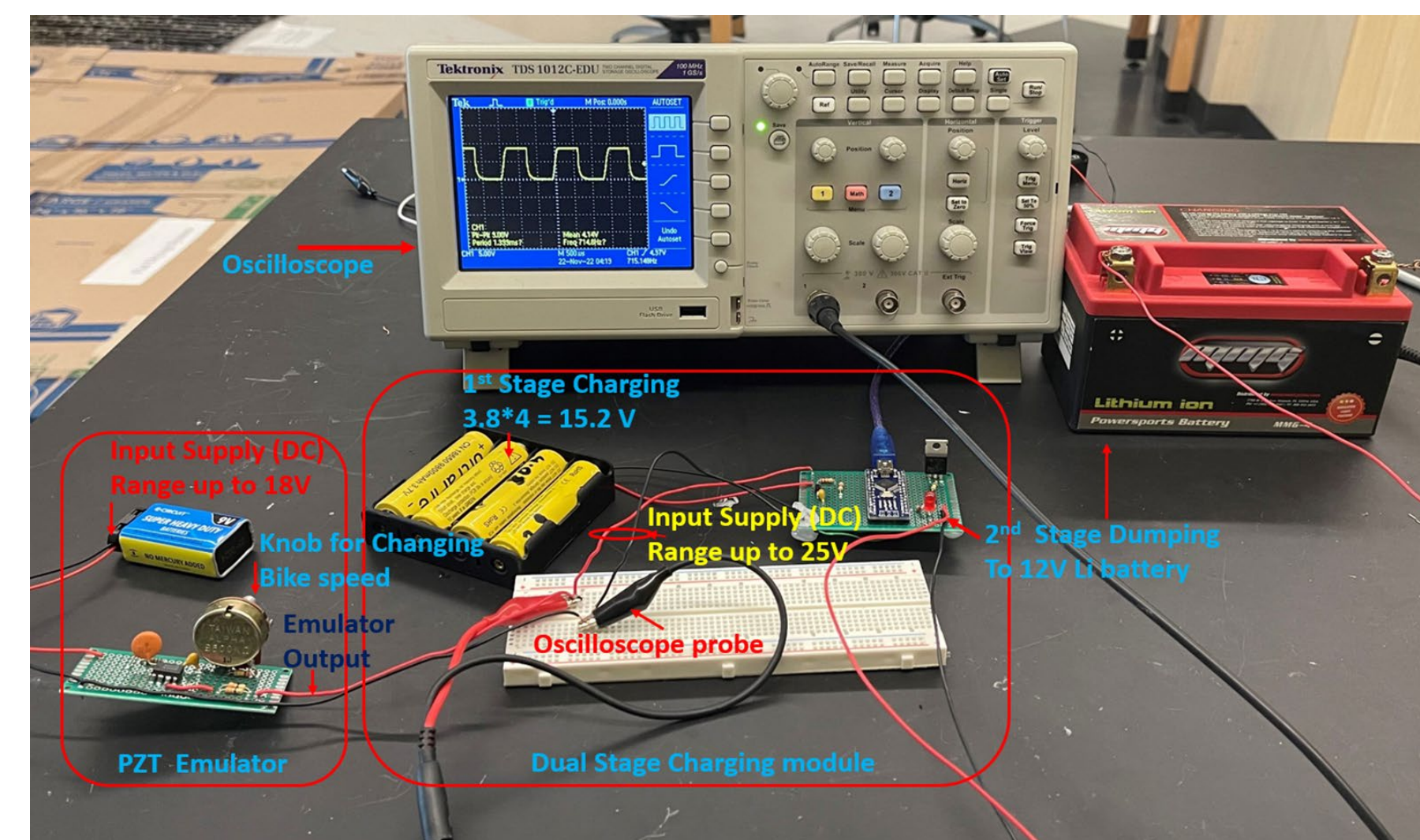
Research Outcome

- Patent: Technologies for energy-generating multilayer composite material for pad application in transportation systems - WO2023225474A1, WIPO is published.

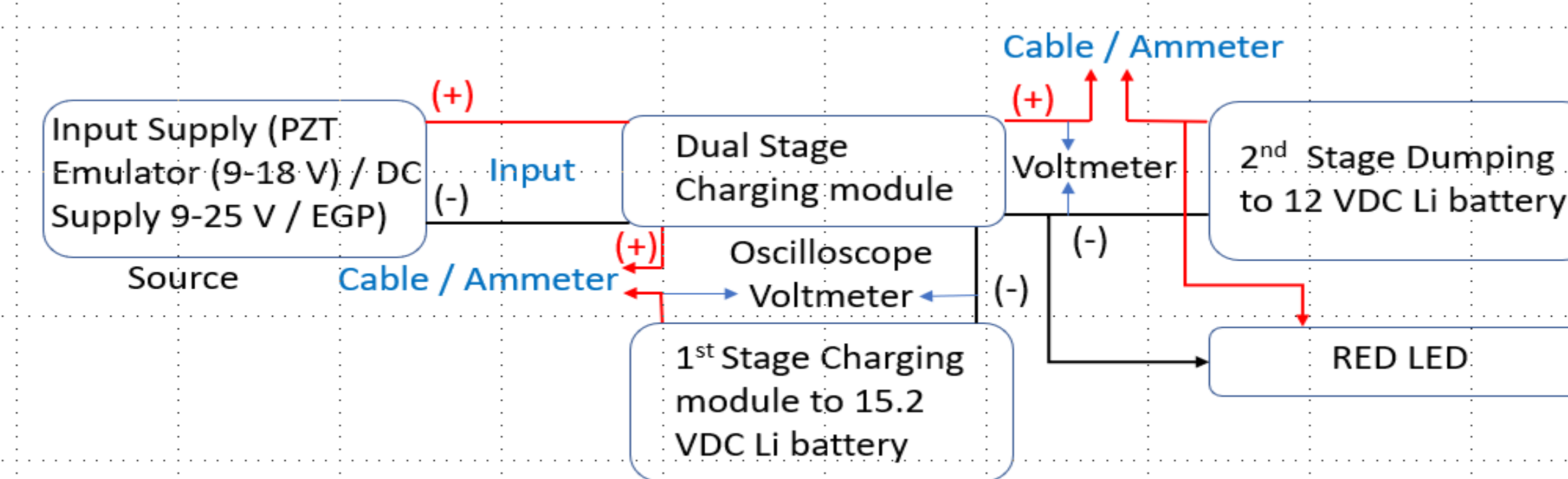
Research Progress (Developed Process and Prototyped of Sustainable EGPs)

- A 7-layer multi-material composite 1XSEGP of 5 ft long was first successfully developed at PVAMU.
- The 1XSEGP prototype exhibited a substantial power of 0.33W/ride to 0.41W/ride while a 150-160lb biker with 10-14mph speed ran on the SEGP.
- The 2XSEGP prototype exhibited a substantial power of 0.54W/ride to 0.67W/ride by a 155lb-avg biker at 12mph-avg speed.
- An improved 5-layer process of the multi-material composite for SEGP was successfully developed at PVAMU to increase quality and thus reduced cost and processing time.
- Students are trained at undergraduate levels, including NSF-REU programs, and graduate students are trained through research.

Research Progress (Developed a of Dual-Stage Charge Controller)



Dual Stage Charge Controller Testing



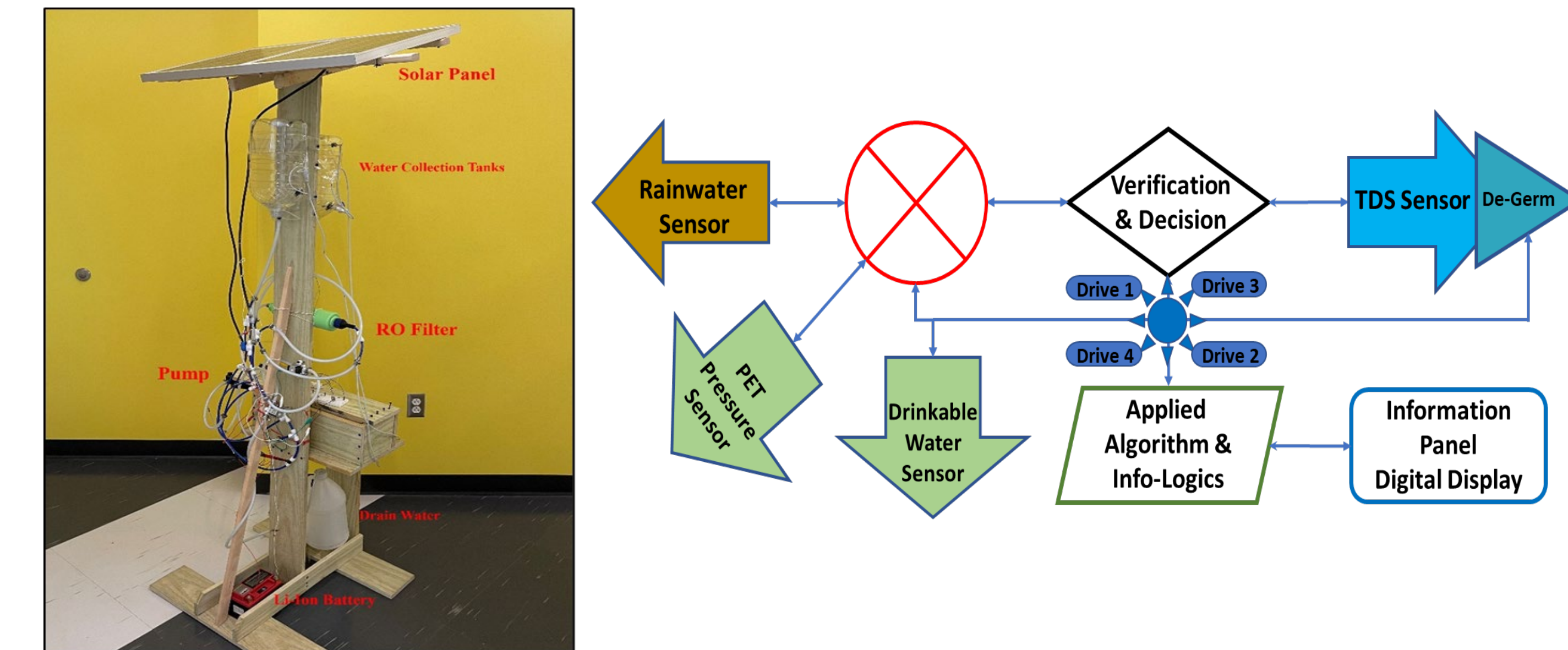
When 1st stage small battery is fully charged. Then, the 2nd stage large battery charging process is turned on, and the RED LED (optional) is also turned on. Otherwise, the RED LED and 2nd stage battery charging process always stay turned off.

- The success of all newly developed energy systems depends on the efficient energy collection and charging system. Developments include:
 - The Dual-Stage Charge Collection (DSCC) system to collect maximum energy from SEGP.
 - An emulator of SEGP with a Smart Charge control system developed for training purposes.

Research Outcome

- Patent: Technologies for dual-stage charge collection and energy storage for alternative energy sources.- WO2023225473A2, WIPO is published.

Research Progress (Developed and prototyped Contactless Reverse Osmosis process)



- Successfully prototyped the concept of the Contactless Reverse Osmosis process (CRO)
- UNTEN was unsuccessful in developing a Smart RO kiosk that used 300W solar panels to process rainwater for drinking.
- The PVAMU team successfully developed the CRO to process more efficiently than using only 30W-35W.
- This smart CRO system has a few custom-designed components.
- Further development is needed for commercialization.

Research Outcome

- Provisional Patent: Solar and EGP hybrid CRO system is submitted for patent.
- Two technical papers have been published.

Broader Impact:

- Bicycles Lane i.e.: Europe, Asia, Even in the USA (California)
- Smart Subways
- Parks and playgrounds,
- People in office buildings and airports.

Future Goals:

- The Monash Team has set up 2 lab sites to develop the 1XSEGP and complete implementation on their campus to monitor, collect data, and develop efficiency metrics.
- The PVAMU team is actively working on the design of a 3xSEGP to achieve 6-timer higher energy and seamlessly connect the microgrid systems of cities worldwide.
- By the 3xSEGP, the technology will transition from an e-bike to an Electric Vehicle (EV) Charging station.

