UTSA | Texas Sustainable Energy Research Institute

Deployment of innovative self-powered sensing and detection systems for smart San Antonio roadways

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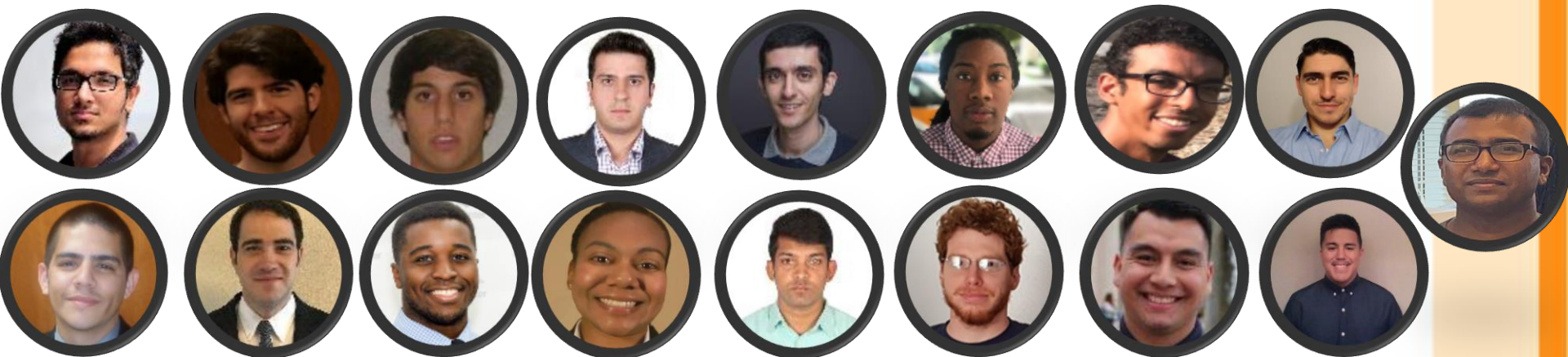


Asphalt Roadways

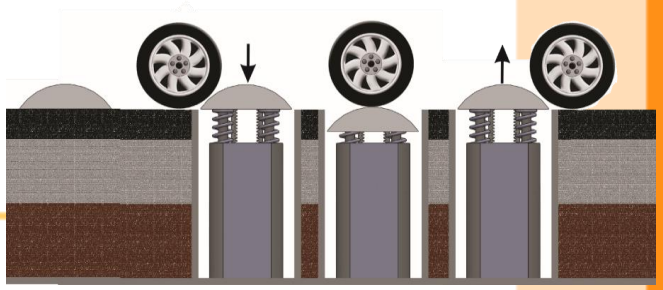
- The United States has more than 2.5 million miles of asphalt roads boosting our economy through connecting communities.

- Transportation agencies are under great challenge to promote safety and monitor roadway network health and traffic operations

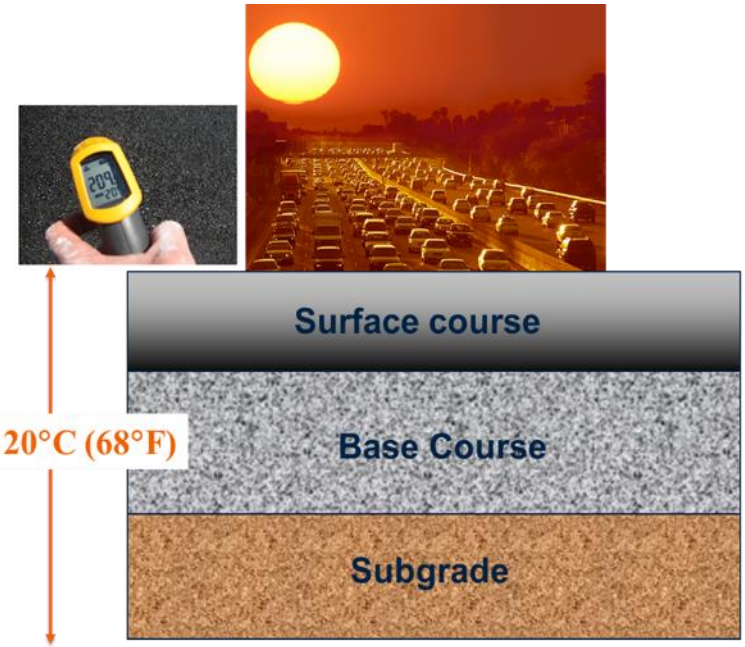
Next Generation Smart SA roads

Smart SA Roads

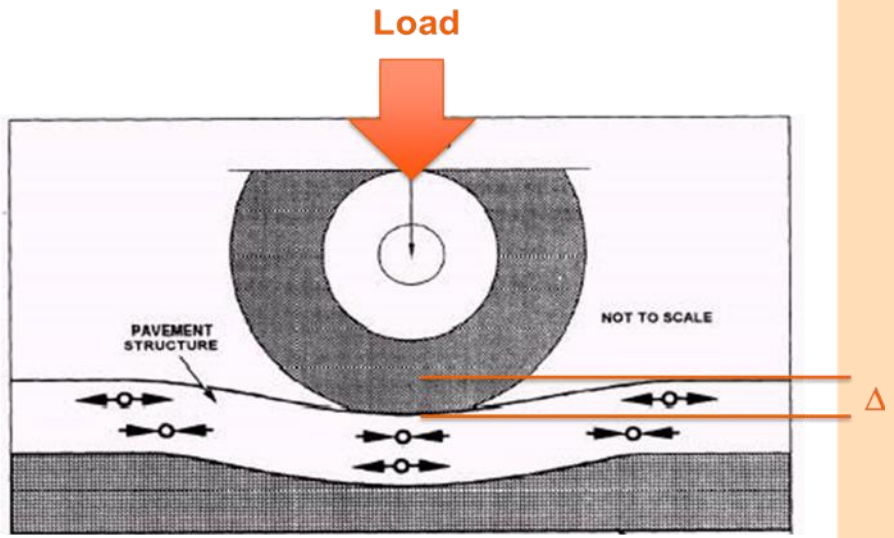
- Road Sensing and Data collection
- Cooling less-congested traffic
- Safety of ped and motorists
- Smart lightening/ warning at crossing zones
- 5 innovative technology
- Prepare workforce (18 students)
- Enabling vehicle-infrast communication



Energy Sources in Roadways



Thermal Energy = Mass x Specific Heat x ΔT

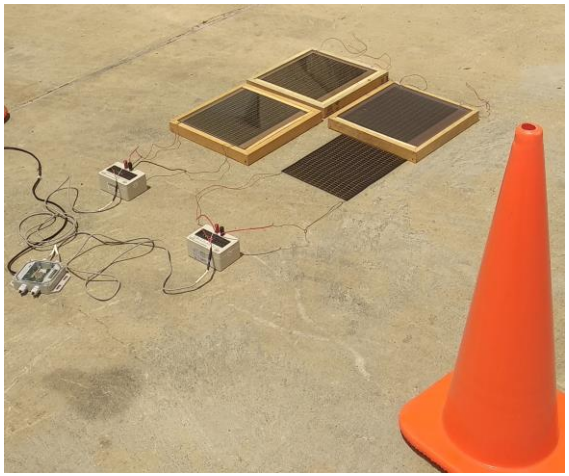


Strain Energy = Load * Δ

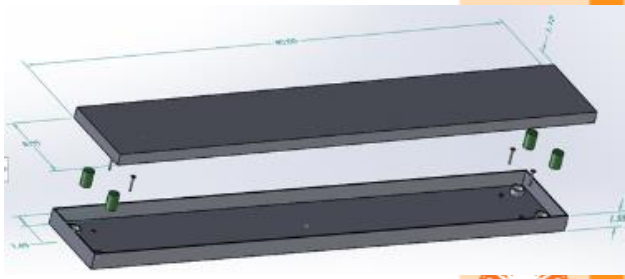
Wasted mechanical/thermal energy can be harnessed in the form of electric power

What we accomplished…

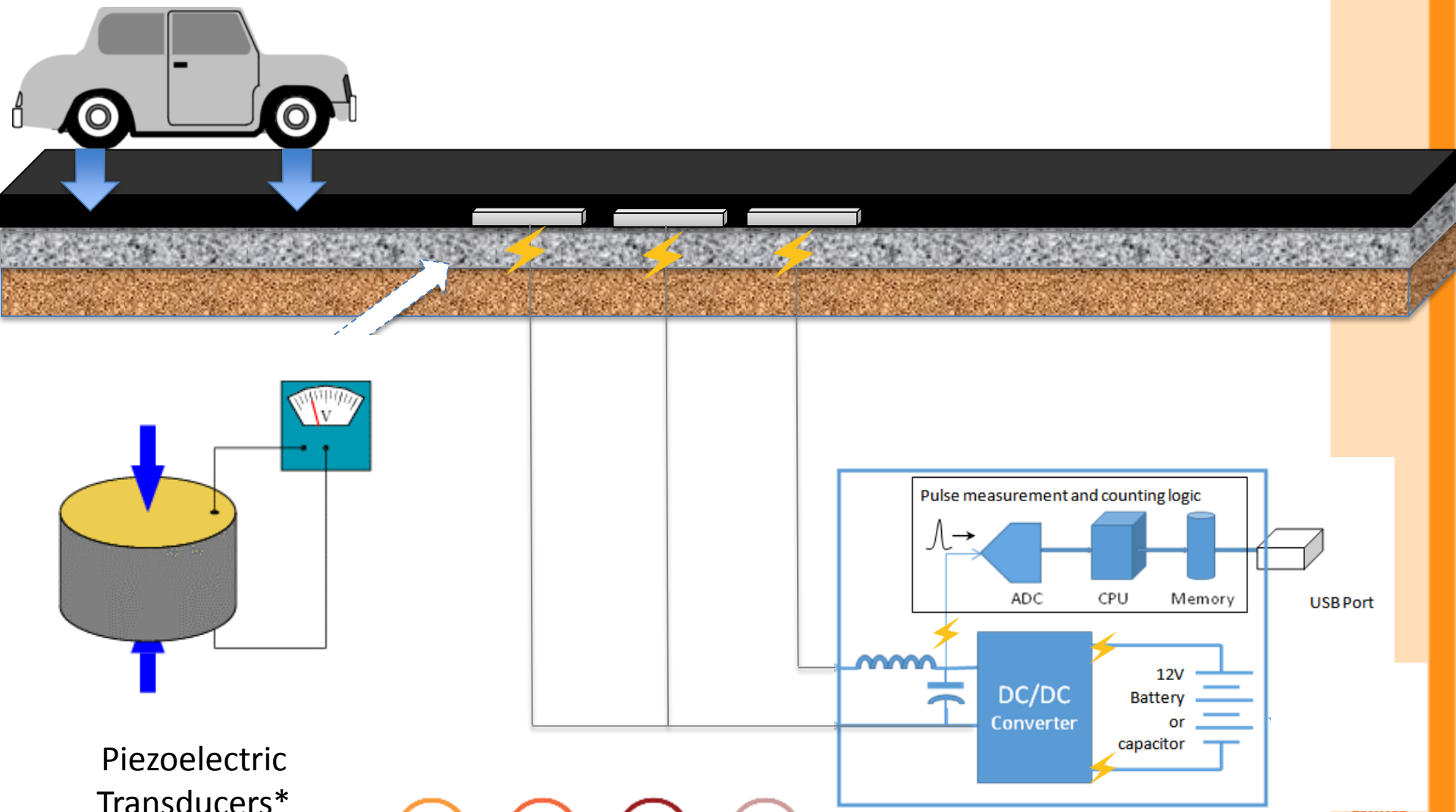
Proof the concept with innovative systems that we could use existing roadways to produce sustainable low-power



Slow speed zones	Urban and low volume roads	Heavy traffic highways	Intersections/ crossing zones	Commercial corridors



Piezo-electric System Design

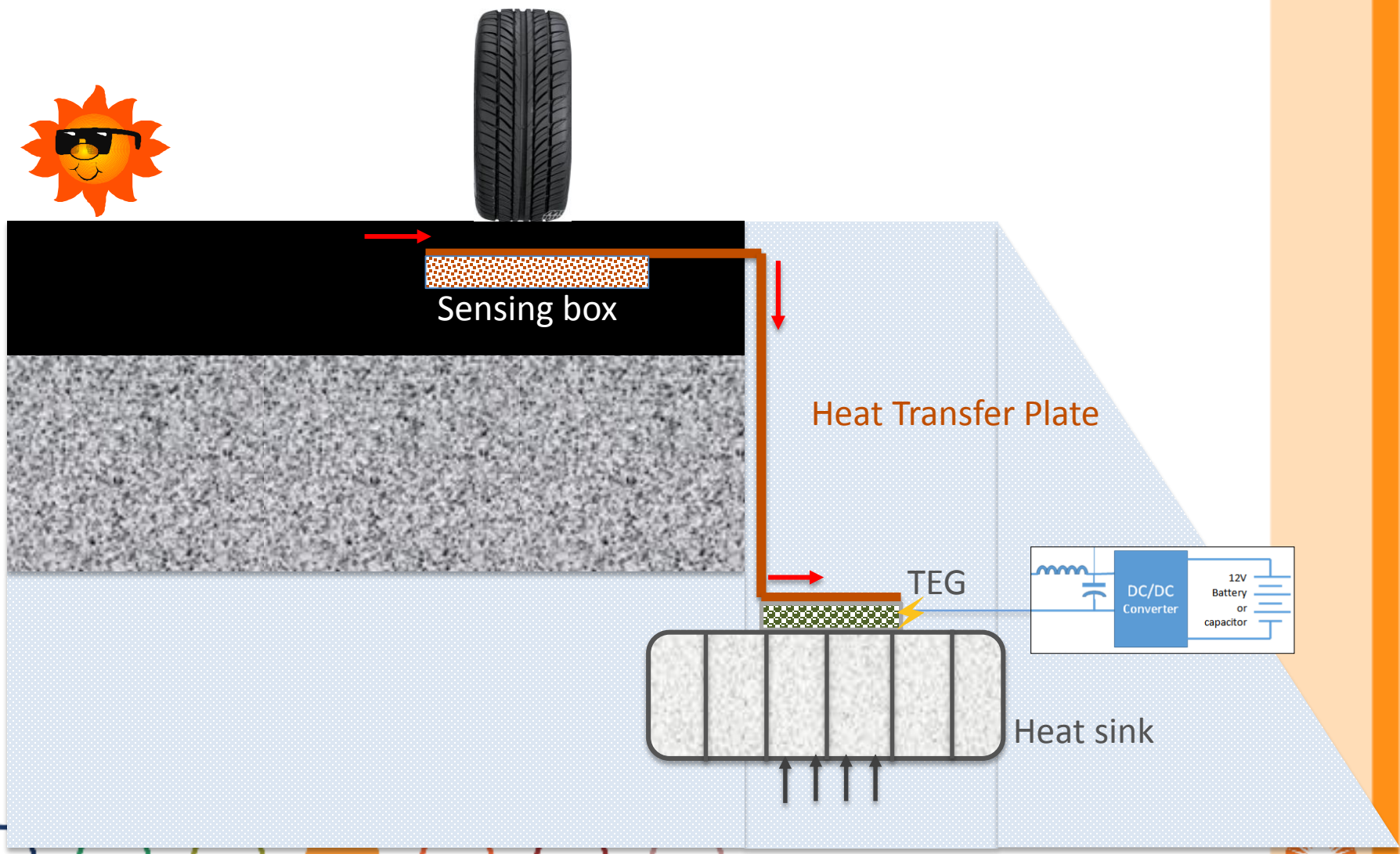


Piezoelectric Transducers*

Roadside Module

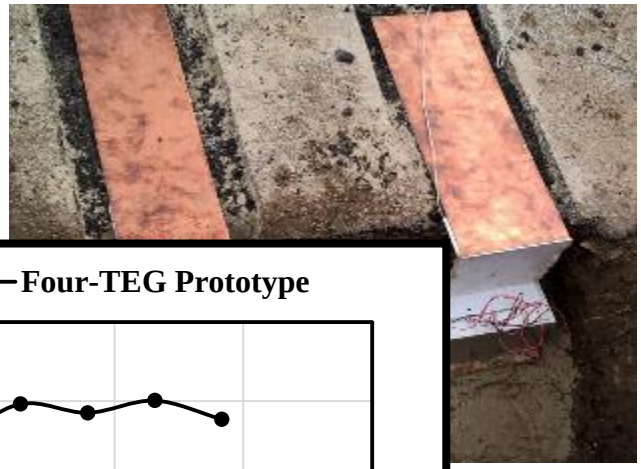
*en.wikipedia.org/wiki/Piezoelectric_sensor

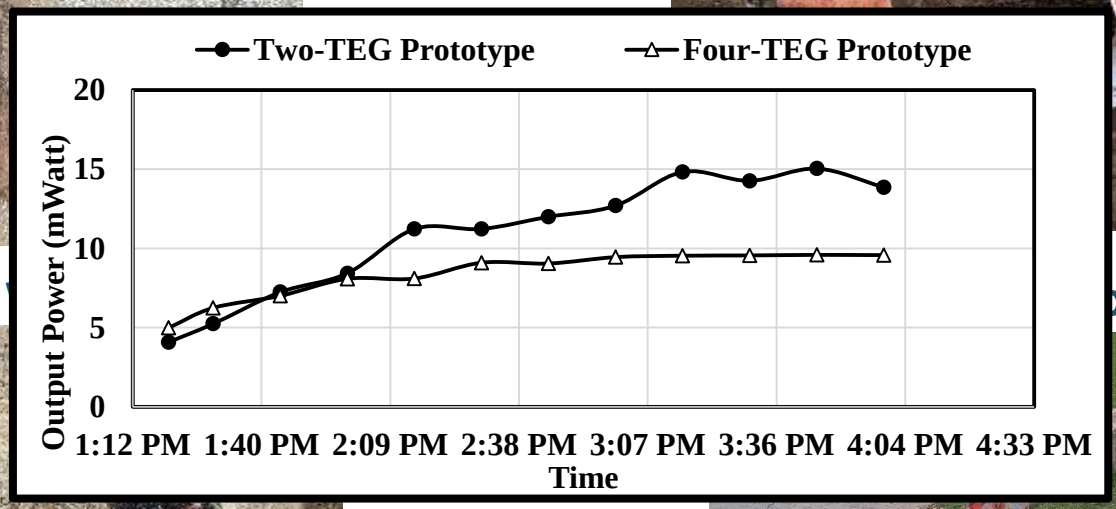
Thermo-electric System Design



Pavement and soil removal

Installation

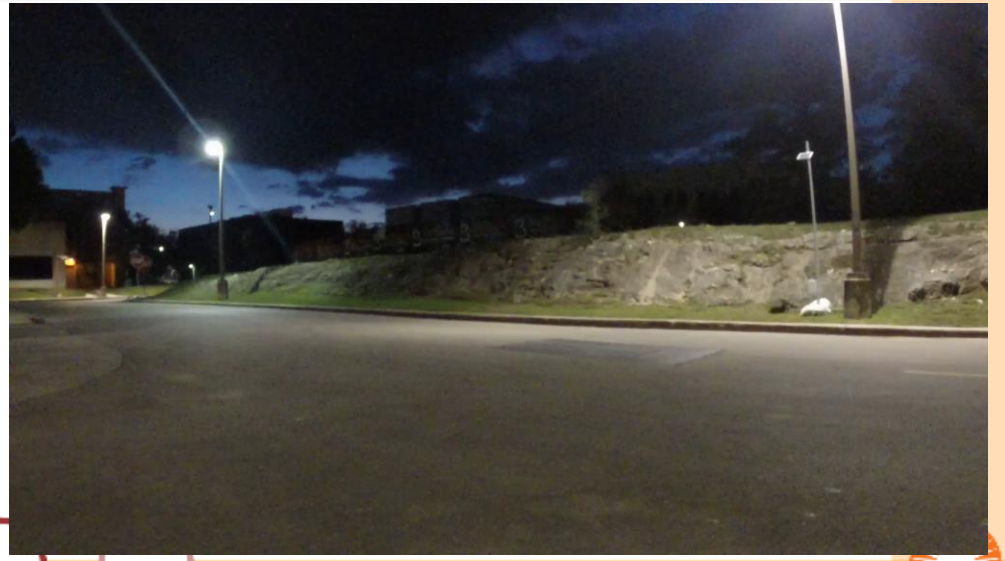




Covering

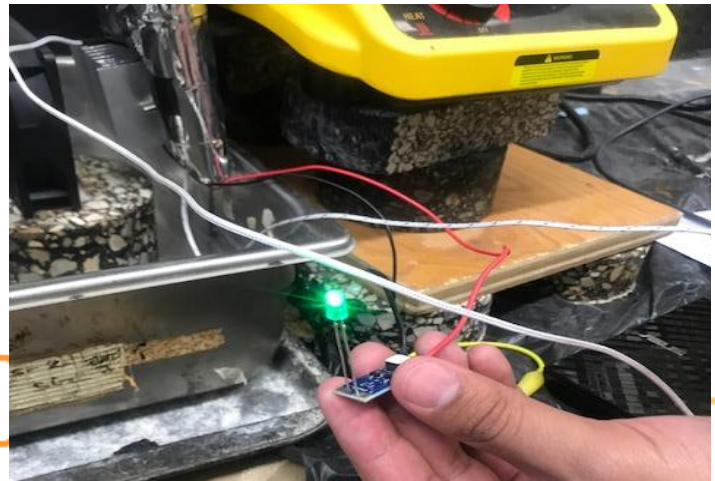
on

Deployment in roadways

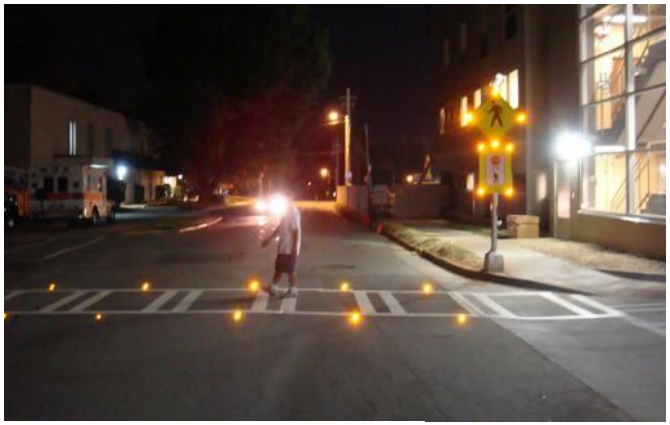


Levelized Cost of Energy (LCOE)

	2 TEG Prototype	4 TEG Prototype	Grid Electricity	Solar Panel
Output thermal gradient (°C)	7	7		
Prototype output (mWatt)	13	8		
kWhr	0.04	0.03		
kWhr / linear meter	5.30	3.26		
PE-COOL cost ($) (excluding installation)	200	100		
Annualized Cost/20 years	10	5		
LCOE ($/kWh)	1.89	1.53	0.20	0.34



Thank You



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