

Bi-Monthly Progress Report:

Project Number and Title: *URI Project 1.11 Energy Harvesting and Advanced Technologies for Enhanced Life*

Research Area: *Devotement of Improved Road and Bridge Monitoring and Assessment Tools*

PI: *K. Wayne Lee, University of Rhode Island (URI), Civil and Environmental Engineering*

Co-PI(s): *Michael L. Greenfield, URI, Chemical Engineering and Sze Yang, URI, Chemistry*

Reporting Period: *June –July 2019*

Date: *7/31/2019*

Overview:

Provide overview and summary of activities performed during previous two months....

Literature review was updated and data was collected from the new embedded pipe apparatus. It consisted of heated water with an embedded pipe (from lab-simulated solar energy harvesting system) through the asphalt cross section. Thermocouples recorded data for the embedded pipe each second for three days.

Literature review utilizing the Seebeck Effect was further researched and updated. Parts for the energy harvester are being measured for correct configuration of the solar apparatus.

Provide context as to how these activities are helping achieve the overarching goal of the project...

The project goal is to extract energy from a pavement that experiences heating due to incoming solar radiation. Warm water and small voltages are two possible ways to extract this experimentally. The first two activities relate to testing this extraction experimentally. The third activity relates to evaluating the feasibility and success of these steps by using parameterized physics- and chemistry-based models.

Describe any accomplishments achieved under the project goals...

Data testing on the pavement core model with an embedded water pipe was an accomplishment for the project. (See Figure 1).

Describe any opportunities for training/professional development that have been provided...

The graduate students working on the project are both in the non-thesis Civil Engineering master's program. They are receiving training that is not usually available to non-thesis students regarding conducting research and actively participating in the research process.

Describe any activities involving the dissemination of research results (be sure to include workshops, seminars, and conferences attended/held for dissemination of information regarding this project) ...

Prof. Lee presented a technical paper, entitled "Infrastructure assessment through solar energy harvesting" at the 4th Renewable Energy Sources – Research and Business (RESRB) Conference, and exchanged research ideas in Poland on 7/8.

Research team submitted a 4-page paper that will be published in Scopus/WoS. The paper is titled *Infrastructure Assessments Through Solar Energy Harvesting*.

UKC2019 (8/15 to 8/17 in Chicago) accepted a one-page extended abstract, which Austin and David submitted. Research team submitted a paper, entitled “Transportation Infrastructure Assessment through Solar Energy Harvesting” to TRB (Transportation Research Record) on 8/1.

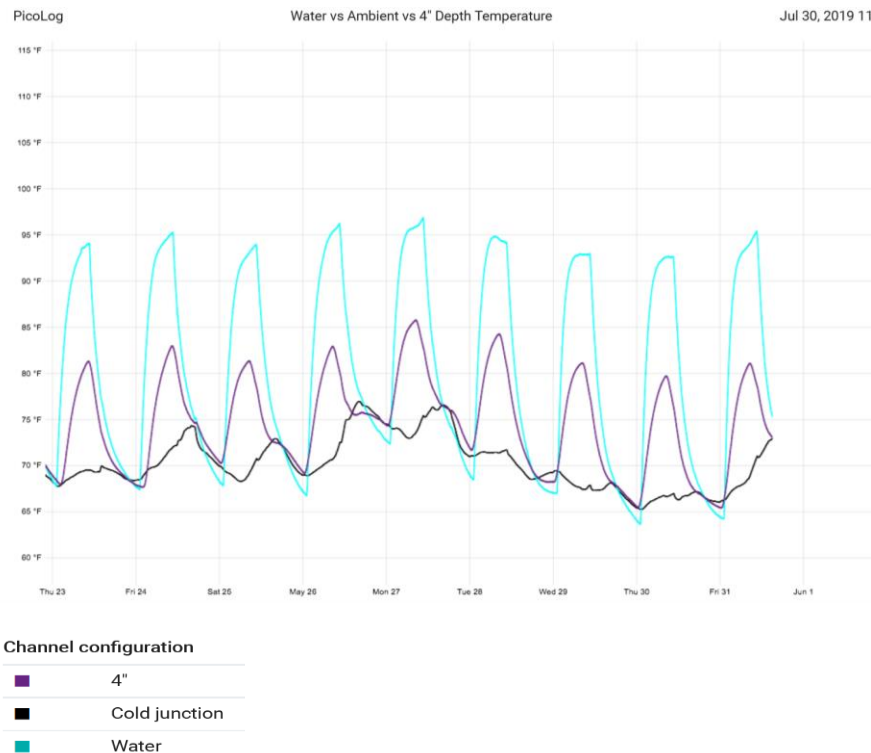


Figure 1: Four-inch Depth vs Ambient Temperature vs Water Temperature

Participants and Collaborators:

What organizations have been involved as partners on this project?

University of Rhode Island, Dept of Civil Engineering, Dept. of Chemical Engineering and Department of Chemistry

Have other collaborators or contacts been involved? If so, who and how?

Name of Technical Champion: Steven Cascione
Title: Programming Services Officer
Organization: RIDOT
Phone number: 401-734-4803
Email: Steven.Cascione@dot.ri.gov

What students have participated in the project? (Include class standing, major, role in the research)

David Schumaker, CVE non-thesis MS student, setting up experiments on heat extraction using water

Austin Decotis, CVE non-thesis MS student, begun design of the experimental setup on Seebeck effect

Mason Hyde, CHE junior, initiated modeling of heat extraction

Changes:

None.

Discuss and changes in approach and the reasons for the change...

Planned Activities:

Description of future activities over the coming months.

Experiments on Seebeck effect between a hot pavement and a cold sink in the ground will be conducted in the lab. Tests using thermoelectric generators will be used.

Construction of the solar harvester involving thermoelectric generators will begin.