Opportunity Title: Producing Pipeline-quality Renewable Methane via Anaerobic Digestion of Waste
Opportunity Reference Code: DOE-MSIPP-16-13-ANL

Organization U.S. Department of Energy (DOE)

Reference Code DOE-MSIPP-16-13-ANL

How to Apply A complete application must include the following to be considered:

- Completion of all required fields in the application
- Undergraduate transcripts
- One Recommendation (minimum)

If you have questions, send an email to Elizabeth Nelson at Elizabeth.Nelson@orau.org . Please include the reference code for this opportunity in your email.

Application Deadline 3/16/2016 11:59:00 PM Eastern Time Zone

Description The Minority Serving Institutions Partnership Program (MSIPP) Internships is a new program to promote the education and development of the next generation workforce in critical science, engineering, technology, and math (STEM) related disciplines that complement current and future missions of DOE national laboratories. The MSIPP Internship program is designed to provide an enhanced training environment for next generation scientists and engineers by exposing them to research challenges unique to our industry.

MSIPP Interns will be given the opportunity to complete Summer Internships aligned with ongoing U.S. Department of Energy Office of Environmental Management (DOE-EM) research under the direction of a host national laboratory. The internship will be performed at the host national laboratory, utilizing their facilities and equipment under the guidance of a research staff member.

Minority Serving Institutions are institutions of higher education enrolling populations with significant percentages of undergraduate minority students.

The main objective of this project is to enhance anaerobic digestion of biosolids generated at wastewater treatment plants (WWTP) with bottom ash/biochar from biomass gasification and pyrolysis process to generate renewable methane at economically useful compositions, close to the pipeline quality (>90% CH4). The bottom ash from gasification and biochar from pyrolysis of lignocellulosics will be used as (a) an adsorbent to sequester CO2 in the biogas, hence upgrade the heating value of biogas (renewable methane); (b) a source of micronutrients, such as Ca, K and P, and alkalinity required for growth of anaerobic microorganisms. The digestion of biosolids with biochar for biogas production will not only reduce required costs (~ $2 Billion per year) for treating, managing and disposing of millions of tons of waste significantly, but also turns waste

liabilities into revenue centers.

The fermenters (0.5 -14 liters) will be operated under fed batch cultivation mode at varying organic loading rates to maximize the renewable methane production. We will evaluate pathways to piloting and scale-up of the anaerobic digestion process. The process model will accommodate a large number of sequential and parallel biochemical and physico-chemical reactions and characterize the biomass growth and gas production kinetics as well as buffering capacity of biochars. This biochemical process model will be used to scale-up the process to 100-liters. We will determine the microbial community structure and composition in the digesters by using metagenomics and quantitative PCR techniques to track fate of methanogens in digesters. These assays will allow us to associate the relative abundance of different microorganisms and their syntrophic relationship in the bioreactor environment as a function of varying reaction conditions. As we identify the member(s) of the mixed microbial community structure that are responsive to the renewable methane production, we may be able to selectively tune the cultivation conditions to enhance their growth, and consequently further improve biofuel production and maximize the yield.

Qualifications

The successful candidates should be one undergraduate senior and one graduate student in chemical or environmental engineering. The undergraduate student should have knowledge and experience in bioreactor design and operation, process modeling, and techno-economic analysis. The graduate student should have considerable knowledge and skills in fermenters, bioreactors, molecular biology, systems biology, renewable fuel production processes, bacteria characterization, process modeling and techno-economic analysis. Good skills in oral and written communications and presentations desireable. Good skills working in team environment. The research project will focus on the enhancement of anaerobic digestion of biosolids generated at wastewater treatment plants to produce renewable methane at economically useful compositions.

Eligibility Requirements:

1. Be currently enrolled as a full-time undergraduate or graduate student at an accredited Minority Serving Institution *see criteria for Minority Serving Institutions here http://srnl.doe.gov/msipp/internships.htm
2. Be working towards a science, technology, engineering, or mathematics (STEM) degree
3. Have an undergraduate cumulative minimum Grade Point Average (GPA) of 3.0 on a 4.0 scale
4. Be a United States citizen
5. Pass a drug test upon selection to participate in the MSIPP *The process and timing for drug testing varies from lab to

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lab. Use of Marijuana/Cannabis or its derivatives if prescribed is legal in some states. However, having these drugs in your system is NOT legal at United States Federal Contractor sites and National Laboratories.

6. Reference must be received by March 6, 2016 at 11:59 PM ET

For more information about The Minority Serving Institutions Partnership Program (MSIPP) Internships, please visit http://srnl.doe.gov/msipp/internships.htm

To see all MSIPP position postings visit: www.orise.orau.gov/MSIPP

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Bachelor's Degree or Master's Degree.
- **Overall GPA:** 3.00
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Computer, Information, and Data Sciences** (16 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)
  - **Mathematics and Statistics** (10 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)

Affirmation

I certify that I am pursuing or have completed coursework towards a degree in science, technology, engineering, mathematics, or a related field.