

## REQUEST FOR LETTERS OF INTENT

Columbia University, in collaboration with Waste Enterprisers Ltd. and the Kumasi Metropolitan Assembly invite proposals to take over and operate a research station that includes a 120 m<sup>3</sup> anaerobic fermentation and digestion/biogas plant, 350 liters/day biodiesel plant, and associated operating and laboratory equipment in Kumasi, Ghana. See below for detailed description of facilities and equipment.

**The deadline for Letters of Intent (LOIs) is July 12, 2013.** LOIs must not exceed 5 pages and should include (1) a title for the proposed project and Principal Investigator(s), (2) a detailed description of the proposed research and objectives, (3) an explanation of how the existing facilities and equipment will be utilized for research, (4) an explanation of the relevance of the research for Ghana and/or sub-Saharan Africa, (5) a list of proposed partners, (6) a completed Equipment Checklist (see below) and (7) existing and/or identified financial resources available to support the proposed research. Please note that access to the facility is not complemented by research funds, utilities, or consumables. Securing research funding is the responsibility of the proposing team.

All LOIs must be submitted in English and reviewers will notify the successful applicants to submit a full proposal by July 25, 2013. Submission of the full proposal will be by invitation alone. Full proposals will be due on August 30, 2013. A final decision will be made by September 30, 2013 and the research station should be transferred in January 2014. The start date for the activities described in this solicitation are expected to commence during Spring 2014 and are negotiable.

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### I. BACKGROUND

The research station has been built for a project focused on developing a technology for producing biodiesel from fecal sludge. The research, led by Columbia University in collaboration with Waste Enterprisers Ltd, Kwame Nkrumah University of Science and Technology, and the Kumasi Metropolitan Assembly, is funded by the Bill & Melinda Gates Foundation and runs from June 2011 through December 2013. The facility is hosted by the Kumasi Waste Management Department and is located at the Dompooase Landfill and Fecal Sludge Treatment Plant in the city of Kumasi, Ghana.

The biogas system features two trains of six anaerobic fermenters/digesters in series. Each reactor has a capacity of roughly 10,000 liters. The reactors are currently being used for public septage, with a loading rate of 5000 liters/day with each digester producing roughly 1-3 m<sup>3</sup> biogas per day. Gas collection from the reactors can be piped to a central gas storage bag. The biogas is not currently used but could serve a variety of purposes, including fuel for a boiler or electric generator. Digester effluent is discharged to an adjacent pond system.

The biodiesel plant has a capacity of 350 liters/day and comprises of a 450 liter heated, cone bottomed reactor vessel, catalyst mix tank, filters, and associated plumbing.

The research station includes the ancillary and laboratory equipment listed in the attached checklist. However, there is not lab space at the site to operate laboratory equipment.

## **II. SELECTION CRITERIA**

1. Potential impact. Applicants must propose original research that has potential to make significant contribution to its field. Proposals will be judged on originality and also on their relevance and practical application in Ghana/sub-Saharan Africa.

2. Capacity for success. Reviewers will look for strong teams that bring both topical and geographic expertise to the proposed research, based on past accomplishments. Researchers must demonstrate ability to source adequate funds to conduct the work.

3. Fit between proposed research and research station. Proposals will be judged on the extent to which they utilize infrastructure and equipment at the research station and the suitability of the existing infrastructure for the proposed work.

## **III. CONTACT INFORMATION**

LOIs should be submitted to **FS2BD123@gmail.com** in Word or pdf format by July 12, 2013. Questions about the RFP may also be directed to this email address prior to the submission deadline.

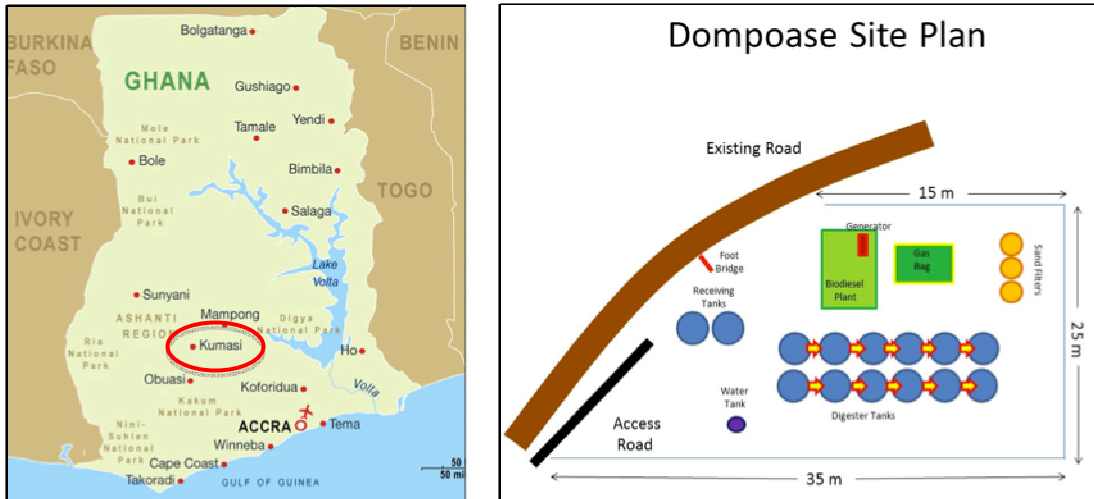
Please include a cover letter for your LOI that includes the following fields:

- Name, email address, phone number and address of lead PI
- Affiliated team members and respective organizations
- Proposal submission date

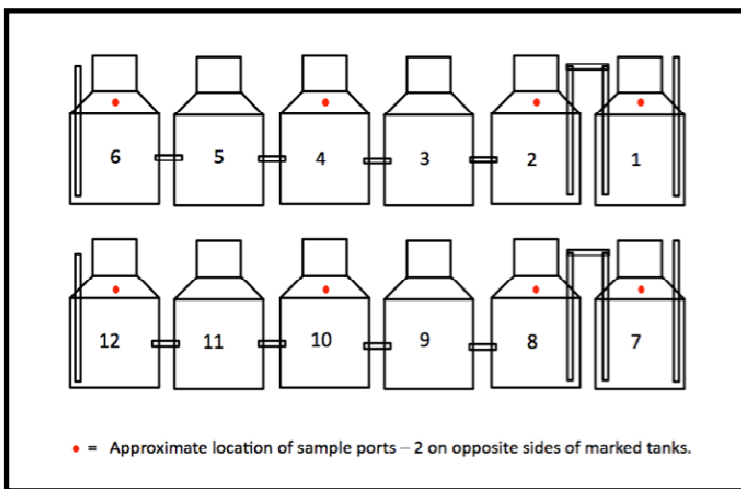
#### IV. ADDITIONAL SITE DETAILS

Figure 1 shows the location of the research station in Ghana and the site plan for the facilities at Dompooase. According to the original design, effluent from the digesters was to go through sand filters and be released to the environment. However, the filters function poorly so effluent has been diverted from the digesters directly to the facultative pond of the existing fecal sludge treatment plant.

Approximately 75 exhauster trucks carrying fecal sludge enter the facility per day and can be diverted to the research station. Access is, however, compromised after heavy rains.



**Figure 1.** Left: Map of Ghana with city of Kumasi in south-central Ghana circled. Right: Schematic of research station located at the Dompooase Landfill/Fecal Sludge Treatment Plant in Kumasi, Ghana.



**Figure 2.** Profile of biogas digesters, which are submerged 3 m underground.

## EQUIPMENT CHECKLIST

Applicants must put a checkmark next to all infrastructure and equipment that they would utilize for the proposed research project. Note: Equipment and infrastructure can be split up so it is not necessary that a successful applicant use every item for their project. This checklist must be submitted with the LOI and is not included in the 5-page limit.

### *Permanent infrastructure*

- 12-tank (2 6-tank systems in series) 120 m<sup>3</sup> Puxin digester system
- 5 x 7 m building (storage area/office space, covered patio for biodiesel plant, generator storage area)

### *Ancillary equipment*

- 500 gal polytank (1)
- 10,000 L polytank (2)
- 20 kW diesel generator
- 2 kW gasoline generator
- 2" trash pump, gasoline
- 2" trash pump, 3 hp electric
- 20' shipping container

### *Biodiesel plant*

- Rotary gear pump TEFC with 1/2" ports
- 120-gal heated reactor vessel (1)
- 30 gallon cone bottom catalyst mix polytank
- 2" bag filter

### *Laboratory equipment*

- Rotovap
- 10x10" hotplate/stir plate (2)
- Analytic balance
- 1.3 L Muffle furnace, 100-1100° C
- 5 kW generator
- Genesys 20 spectrophotometer
- Low temperature incubator
- Fyrite Classic gas analyzer, 0-60% CO<sub>2</sub> kit