U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Bioenergy Technologies Office
REQUEST FOR INFORMATION
Golden Field Office

WASTE: Waste Applications for Sustainable Technologies for Energy

Request For Information Number: DE-FOA-0000933

CFDA Number 81.087

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Closing Date: July 15th, 2013, 8:00 PM EDT

Responses must be submitted via email to: WasteToEnergy@go.doe.gov

This is a Request for Information (RFI) only. DOE will not pay for information provided under this RFI, and DOE will not accept, review, or consider any applications for Financial Assistance in response to this RFI. At DOE's discretion, DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

Request for Information
U.S. Department of Energy
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Federal Financial Assistance for WASTE: Waste Applications for Sustainable Technologies for Energy
DE-FOA-0000933

PROGRAM MANAGER/AREA: Valerie Reed, Acting Director, Bioenergy Technologies Office, Energy Efficiency and Renewable Energy, U.S. DOE.

SUBJECT: Request for Information (RFI) on the need for federal financial assistance for the research, development, demonstration and deployment (RDD&D) of emerging waste-to-energy (WTE) technologies for the production of fuels, products, and power.

DESCRIPTION: The Department of Energy (DOE) seeks feedback from public and private sector stakeholders regarding the state of technology development and commercial readiness of emerging WTE technologies. Information is also sought in identifying what barriers to commercialization remain and the appropriate role for DOE with regard to additional investment in RDD&D to promote broad adoption and commercial replication.

BACKGROUND: The Bioenergy Technologies Office (BETO) is a key component of the DOE's Energy Efficiency and Renewable Energy (EERE) portfolio. EERE seeks to provide clean, safe, secure, affordable, and reliable energy from diverse domestic resources, along with the benefits of increased energy security and reduced criteria pollutants and greenhouse gas emissions. Heightened public and private-sector interest in the utilization of waste as a feedstock for renewable energy applications has drawn the attention of the DOE. BETO would like to solicit information on the state of technology development in the WTE industry. While the incineration of municipal solid waste (MSW) is recognized as a mature technology practiced on a global scale, there are other emerging WTE technologies that can produce fuels, products, and power that have not yet been developed to the point of broad commercialization.

DISCLAIMER AND IMPORTANT NOTES: This RFI is not a Funding Opportunity Announcement (FOA); therefore, DOE is not accepting applications at this time. DOE may issue a FOA in the future based on or related to the content and responses to this RFI; however, DOE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if DOE chooses to issue a FOA regarding the subject matter. Final details,

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including the anticipated award size, quantity, and timing of DOE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. In accordance with the Federal Acquisition Regulations, 48 C.F.R. 15.201(e), responses to this notice are not offers and cannot be accepted by the Government to form a binding contract. DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

PURPOSE AND NEED FOR INFORMATION: The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other public and private sector stakeholders to assist DOE with the development of a strategic program in advanced WTE and possibly a FOA that supports WTE topics. The program could include, but is not limited to investigation of bioenergy technologies such as pyrolysis, biomass gasification, and anaerobic digestion. BETO is also interested in receiving feedback on high-impact biomass waste feedstock resources including, but not necessarily limited to, the organic fraction of MSW and bio-solids from municipal wastewater treatment plants.

DOE'S UNDERSTANDING OF THE STATE OF THE INDUSTRY: The Environmental Protection Agency (EPA) estimates that the United States has about 87 operational MSW-fired power generation plants that generate approximately 2,500 megawatts (MW), or about 0.3 percent of total national power.[1] In addition, there are 3,171 wastewater treatment facilities in the U.S of which 1,351 (43%) currently utilize anaerobic digestion to generate biogas.[2] The cost of electricity for moving and treating water and wastewater in the U.S. accounts for between 25-30% of total plant operation and maintenance (O&M cost. That) costs. This cost can be eliminated or offset through various --WTE pathways.

Although interest in WTE has been increasing, the U.S. still lags behind Europe and Asia in utilization of this resource. Without an increase in productivity and/or a reduction in the cost of conversion system deployment, most MSW will continue to be landfilled, releasing almost 1 billion metric tons of methane into the atmosphere annually.[3] In contrast to other biomass-to-

[1] http://www.epa.gov/cleanenergy/energy-and-you/affect/municipal-sw.html
[2] http://www.epa.gov/chp/documents/wwtf_opportunities.pdf
[3] Waste To Energy Technology EPRI Report

energy pathways, a WTE infrastructure is already in place, increasing the likelihood of a near-term market entry point for this technology.

WTE facilities can offset their costs of operation through distributed and community- scale generation of heat, power and fuel. Approximately 2 megawatt hours (MWh) of heat and 0.67MWh of electricity can be produced in efficient plants from one ton of waste feedstock. In Denmark, heat from WTE facilities provides about 18% of district heating production and 3% of the country's total electricity production.[4] If conversion rates of MSW in the U.S. can be brought to 40% efficiency, WTE applications could result in 125.4 million MWh of renewable thermal energy and 42.5 million MWh of electricity per year.

The U.S. also lags behind the European Union in the development and commercialization of anaerobic digestion as a WTE technology application. Anaerobic microbes are less understood than their aerobic counterparts, and the potential to increase their efficacy and broaden their application for other useful bio-products is extensive. Recent studies on microbial composition have focused both on population dynamics and the syntrophic metabolic cascade, as well as categorization of microbial population functions. Further understanding and exploitation of the syntrophic interaction among methanogens and acetogenic bacteria could play a significant role in improving the efficiency and broadening the technical application of anaerobic digestion for fuels, products, and power. Studies have shown that anaerobic consortia generate a diverse population of enzymes capable of metabolizing lignocellulosic material and carbohydrates, and chelating heavy metals, which could have applications in various new process applications. The respective functions among microbial consortia are relatively unknown, and classification will aid in improving conversion and reducing operating costs of waste-to-energy plants.

RESPONSE GUIDELINES: All responses to this RFI must be provided as an attachment in an e-mail message addressed to WasteToEnergy@go.doe.gov with the subject line "Response to RFI" no later than 8:00pm (EDT) on JULY 15TH, 2013. **Responses must be provided as a Microsoft Word (.doc/docx) or PDF attachment to the email, of no more than 3 pages in length, 12 point font, 1 inch margins, not to exceed 2MB in size. Only electronic responses will be accepted. Responses submitted by any other means will not be considered by DOE.** Questions regarding the content of this RFI must be submitted to WasteToEnergy@go.doe.gov.above with the subject line "Question".

Please specify the topic category in your response. Specific categories of interest are identified later in this RFI. Respondents may answer as many or as few questions as they wish, provided they have reasonable expertise or knowledge in the given subject area. If you wish to provide input to more than one category of interest, you should submit a separate response for each

[4] http://www.wtert.com.br/home2010/arquivo/noticias_eventos/waste-to-energy.pdf Global Energy Network Institute

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category. Each response should not exceed 3 pages in length. **Please do not provide any information which may be considered proprietary or confidential.**

Respondents are requested to provide the following information at the beginning of their response to this RFI:

- Company / institution name;
- Company / institution contact;
- Contact's address, phone number, and e-mail address.

PROPRIETARY INFORMATION: Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are not to provide any information which may be considered proprietary or confidential.**

CATEGORIES OF INTEREST:

In responding to this RFI, respondents are encouraged to provide as much pertinent information on WTE technology applications as possible and should not necessarily constrain their responses to the specific bullets identified in the categories listed below. Collaborations between researchers, equipment vendors, and institutional or industrial companies should be emphasized:

CATEGORY 1: State of WTE Industry, Technology Development and Technology Readiness

1. How do you define waste-to-energy? What is your assessment of the state of the technology in the WTE industry?

2. What are the most promising new areas in the field of WTE R&D that U.S. DOE should consider? Is there any current federal assistance in these areas? Are there any existing policies that present barriers to this technology and prevent its expansion?

3. What waste feedstocks should be considered eligible for funding within a Waste-to-Energy RDD&D effort and why?

4. What technology options can be applied to convert waste biomass feedstocks into fuels, products, or power? What are the potential benefits or impacts of these technologies if deployed? What barriers must RRR&D activities overcome in order for these options to be competitive?

5. What characteristics do you think are desirable in using waste as a feedstock? What characteristics would be undesirable and why?

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CATEGORY 2: Moving from Pilot to Commercial Scale in Waste-To-Energy with the Intention of Producing Fuels, Products and Power

1. What major technical or economic barriers are you experiencing in your efforts to transition from pilot to commercial scale waste-to-energy operations and what role should government play in assisting in this transition? Please do not include any proprietary information in your response.

2. What unit operations in your waste-to-energy process technology could be improved and how would this help enable commercial operations?

3. What technologies and pathways have proven to be the most effective, and what technologies and pathways present difficulties in scale up? How could those difficulties be overcome with Federal assistance?

4. Elaborate on the need for additional RDD&D on the effluents produced by WTE technologies. Effluents could include those from biorefineries, breweries, or any other industrial operations with excess waste water.

5. Comment on the technology applications that have been developed and tested under detailed investigations, and small scale integration efforts that would be ready to be demonstrated at a larger, pre-commercial scale.

6. What high-value bio-products, beyond heat, power, and fuel, could be produced by WTE technology applications and what does the potential market for those products look like? Please provide specifics on the associated feedstocks as well as estimates of economic calculations and analysis.

CATEGORY 3: Modular/Distributed and Community Scale Applications of Waste to Energy for Producing Fuels, Products and Power

1. Outside of current efforts in the dairy industry, what innovative systems approaches are available for anaerobic digestion (AD) and other WTE process technologies to generate and effectively utilize, waste, heat, power, and/or fuel locally? Provide examples of systems if possible and an estimate of the economics.

2. In attempting to increase the productivity and efficiency of AD by increasing the effectiveness of the microbial consortia, what characterization methods and laboratory techniques have had the most success? Which microbial interactions require more study

in the syntrophic cascade of the anaerobic digestion hydrolysis, acid/acetogenesis or methanogenesis, and which area would be the most effective in increasing AD productivity and efficiency? Responses concerning technology innovations necessary to help overcome “stalls” or “sick digester syndrome” in AD are encouraged.

3. What benefits do you envision from the availability of modular WTE conversion systems that? How would these benefits enable broad application of WTE technologies to municipal, institutional, industrial, military and potentially even residential applications? What are the significant technical or operational barriers related to small scale modular/distributed waste-to-energy plants? What research is necessary to overcome these barriers? What is a reasonable length of time and monetary investment required to overcome these barriers? Are new advanced manufacturing capabilities or technologies required to realize the potential of distributed WTE conversion systems?

4. Which pathways for distributed/modular and community scale applications of --WTE will have the greatest environmental benefit based on life-cycle-analyses of these operations? What can be done to improve the life-cycle-analysis of existing waste-to-energy applications, either at large or small scale? Life-cycle-analysis estimates are encouraged.

EVALUATION AND ADMINISTRATION BY FEDERAL AND NON-FEDERAL PERSONNEL: Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to DOE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

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