

## Reed, Katie

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**From:** Neal, Steve  
**Sent:** Tuesday, May 03, 2016 3:17 PM  
**To:** Smith, Randy  
**Cc:** Reed, Katie; Martin, Linda  
**Subject:** Preliminary Prospectus - ATI Bioenergy & Biological Waste Management major  
**Attachments:** Bioenergy & Biological Waste Mgt Pre-proposal SP2016.pdf

Randy,

Attached is a preliminary prospectus for the establishment of a new associate of applied science major in Bioenergy and Biological Waste Management (BIOWMGT-AA) at the Agricultural Technical Institute within the College of Food, Agricultural, and Environmental Sciences. This new major is intended to prepare students to work in the emerging bioenergy industry which utilizes anaerobic digestion to convert organic waste to methane and other by-products to be used for a variety of purposes. Biodigesters are being installed in a number of settings to utilize and reduce organic waste including: food processing facilities; large-scale livestock production units; and municipal wastewater treatment facilities. Skilled technicians are needed to install, service and operate the digesters, and related facilities and equipment, as well as monitor wastewater treatment processes and water quality.

Development of this proposal was guided by an ad-hoc industry advisory committee and the preliminary prospectus outlines a significant need for employees in this sector of the economy. Minimal investment will be necessary to initiate this new major. The College of Food, Agricultural, and Environmental Sciences has a strong research program in bio-based products and bioenergy on the Wooster Campus. This program will capitalize on existing faculty and laboratory research assets and established industry partnerships. Additionally, ATI already has the core resources in place for this program including: faculty and technician expertise; instructional laboratory space and equipment; and existing courses.

This proposal was reviewed and approved by the ATI Division of Arts, Science and Business Technologies faculty, the ATI Academic Affairs Committee, the ATI faculty, and the College Academic Affairs Committee. If this preliminary prospectus is approved, our plan is to submit the full proposal for this new major in the fall of 2016.

Please let me know if any additional information is needed in support of this request.

Steve



**Steven M. Neal, Ph.D.**

Professor and Assistant Dean for Academic Affairs  
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April 19, 2016

Dr. Steve Neal  
Assistant Dean for Academic Affairs  
100E Agricultural Administration Building  
2120 Fyffe Rd  
Columbus, OH 43210

Dear Dr. Neal,

I am writing to request approval of the attached preliminary prospectus to establish a new Associate of Applied Science major in Bioenergy & Biological Waste Management (BIOWMGT-AA). The pre-proposal was approved by the Arts, Science & Business Technologies Division and the Ohio State ATI Academic Affairs committee, and by the Ohio State ATI faculty.

An ad-hoc advisory group consisting of Ohio State ATI faculty, OARDC faculty, the Director of Business Training & Educational Services, and representatives from the Operator Training Committee of Ohio (OTCO; a professional organization associated with the industries this major would prepare students to enter), have been collaborating to prepare this program offering. As you will note in the pre-proposal, students will utilize facilities and equipment at Ohio State ATI and the OARDC. This major is intended to train students in the areas of bioenergy, water and wastewater treatment, and replaces the Renewable Energy-AS degree program that is in the process of being deactivated. It is our belief that this new major will reach and attract prospective high school students interested in a career path focused on bioenergy and water/wastewater treatment, as well as workers in the industry who are looking to acquire new skills and expand their career opportunities in these industries.

Feel free to contact me if you have any questions or need any additional information regarding this pre-proposal.

Sincerely,

Jeanne M. Osborne  
Assistant Director, Academic Affairs

## PRELIMINARY PROSPECTUS FOR THE ESTABLISHMENT OF AN ASSOCIATE of APPLIED SCIENCE MAJOR

- A. **Title of Proposed Major:** Bioenergy & Biological Waste Management - Associate of Applied Science (BIOWMGT-AA). The proposed major is a new major, which utilizes the framework of the recently deactivated Renewable Energy – Associate of Science major.
- B. **Rationale for the Proposed Major:** The Associate of Science in Renewable Energy (RNEWNRG-AS) major is in the process of being deactivated as a result of the lack of a clear pathway to a bachelor degree program, in line with the Ohio Department of Higher Education (ODHE) guidelines. To date, no graduate of the Renewable Energy-AS major has proceeded to a bachelor program in Columbus. Conversely, the vast majority of graduates of the AS program have gone ahead to pursue careers in industry. This therefore, suggests that an Associate of Applied Science major in this discipline is a more rational route for training students interested in this area than an Associate of Science program. The proposed AAS program is intended to train students in the areas of Bioenergy, water and wastewater treatment. This is largely informed by the increasing number of job openings in bioenergy, water and wastewater treatment in the State of Ohio. Across the country, there is an increasing number of retirees in the service and utility sectors of which water and wastewater treatment are among the most severely affected, especially in the Northeast and in the Midwest, including Ohio<sup>1,2,3</sup>. This represents a significant loss of experience and expertise in the industry that warrants an urgent response.

According to the Operator Training Committee of Ohio (OTCO), which administers certifications to operators in the water and wastewater treatment industry, there is a dire need in the State of Ohio to encourage and train young people in this sector to secure the future of an ever important service industry. Globally, according to the World Wide Fund for Nature<sup>4</sup>, 1.1 billion people worldwide lack access to clean water. At the present water consumption rate, 2/3 of the world population will face serious shortages by 2025<sup>4</sup>. A predominant factor responsible for the current global water crisis is increasing human population, which has more than doubled in the last 50 years<sup>4</sup>. Consequently, agro-intensive nations such as the United States, India, Australia, and China have either reached or are nearing their water resource limits<sup>4</sup>. In response to this grim scenario, there is a global impetus for water conservation and preservation, with strict pollution prevention, usage and recycling laws. For instance, the State of Ohio currently restricts the dumping of organic municipal solid wastes (MSW) in landfills in response to ground water contamination. This has increased interest in biological waste treatment and water recovery, thereby increasing the demand waste treatment technicians<sup>1,3</sup>. In a similar vein, anaerobic digestion, which doubles as a means of solid waste and wastewater treatment and energy generation, has expanded significantly in Ohio, thereby, increasing the demand for plant operators and technicians.

Ohio is a predominantly agro-based economy with a robust food processing sector that collectively generates millions of tons of organic residues annually. Towards converting these wastes to value-added products, efforts are being intensified across the State to

generate electricity and fuels from waste residues. Dairy farms in Ohio currently produce 38,000 megawatt hours of electricity annually, and this is expected to increase significantly with more farms adopting a similar strategy<sup>5,6,7</sup>. Further, 478 million gallons of bioethanol is produced in Ohio annually, involving key industry players such as POET Biorefinery, Valero Renewable Fuels and Anderson Marathon Greenville ethanol<sup>5,6,7</sup>. At present, Green Biologics in Columbus Ohio is vigorously pursuing bio-butanol production from lignocellulosic biomass (agricultural residues). Overall, the bioenergy industry in Ohio generates several thousand jobs, the sixth largest in the country<sup>5,6,7</sup>. Therefore, it is imperative to train the workforce needed to sustain this growth (in the bioenergy sector) and to secure the future of clean water supply in the State of Ohio. Thus, the proposed AAS program in Bioenergy and Biological Waste Management is intended to address the above-listed training needs in the State.

- C. **Relationship of the Proposed Applied Degree to the Mission of ATI/CFAES:** The mission of Ohio State Agricultural Technical Institute (Ohio State ATI) is to provide quality technical educational training for its students in the areas of agriculture, horticulture, environmental sciences, business and engineering technology leading to associate of science and associate of applied science degrees. The overarching goal of Ohio State ATI is to equip individuals to be technically competent, self-reliant and productive citizens in a global society. The College of Food, Agricultural, and Environmental Sciences (CFAES) is committed to providing personal attention, career track options, and real-world learning experiences that prepare students for a career closely aligned with their personal interests. The university at large is committed to tackling the world's most pressing challenges through long-term research, teaching and engagement as outlined in its Discovery Themes: Energy and Environment, Food Production and Security, and Health and Wellness. The underlying theme of the mission statements of Ohio State ATI, the CFAES and the University is to train and equip professionals that can contribute meaningfully to solving some of the world's most pressing challenges, of which environmental sustainability and resource management is one, against a back drop of a growing human population. The proposed major is directly aligned with this need – environmental sustainability and resource management. An Associate of Applied Science degree in bioenergy and waste management (with emphasis on water resource recovery) will equip students with hands-on training relevant to applicable skills in the bioenergy and water/wastewater treatment industries; an area that is particularly prominent in the university's discovery theme due to its relevance globally.
- D. **Proposed Implementation Date:** The proposed program is proposed to commence in Autumn 2017.
- E. **Department Responsible for the Major and Supporting Departments:** The proposed Bioenergy & Biological Waste Management - AAS program will reside in the Arts, Science and Business Technologies (ASB) Division of Ohio State ATI. Students majoring in this program will take courses in Math, English, Environmental Sciences, Engineering Technology, Physics, Chemistry and Rural Sociology, all of which are available at Ohio State ATI, with the majority of these courses residing in the ASB division.

- F. Description of the Major:** The proposed Bioenergy & Biological Waste Management – AAS program is intended to prepare students to work in Ohio’s growing bioenergy sector and in the water and wastewater treatment sector, which is currently in need of plant operators and technicians. This program will prepare students with the knowledge and skills to get started in the bioenergy and waste management industries.
- G. Source of Students and Enrollment Projections:** High schools across Ohio will be targeted for the recruitment of students. To work as a wastewater treatment plant operator in Ohio requires that interested candidates obtain certification from the Operator Training Committee of Ohio (OTCO). Therefore, the Bioenergy & Biological Waste Management - AAS program will serve as preparation for OTCO certification. Hence, we intend to collaborate extensively with OTCO (which conducts enlightenment programs and exams across the state) towards recruiting high school students and workers in the industry who are looking to acquire new skills and expand their career. It is anticipated that the proposed AAS program will attract at least twenty new students per year over the next four years.
- H. Availability of the Proposed Major at Other Leading Universities:** An extensive search revealed that while some universities such as the University of Vermont and the University of Illinois have undergraduate and master’s degree programs in bioenergy; however, there is no bioenergy and waste management major at any leading university. Further, there is no Associate of Applied Science or comparable degree program in this area of study at any university in the country.
- I. Impact of New Major on Facilities, Faculty and Support Staff:** Since the proposed Associate of Applied Science major is being modified from an existing Associate of Science major, there is no additional staffing or equipment need. The existing Renewable Energy – AS program includes a Bioenergy laboratory which is equipped with a rotary shaker, a respirometer (for anaerobic digestion), and apparatus for measuring chemical oxygen demand (COD), total nitrogen, total phosphorus and coliforms. Recently, the laboratory acquired a Touch Screen CFX Thermocycler and is in the process of acquiring a 5-liter bioreactor. Dr. Victor Ujor who is the current coordinator of the AS program has extensive experience in bioenergy (waste to biofuels) and is supported by a lab technician, Nathan Firestone, an experienced technician with vast experience in relevant techniques required for teaching practical aspects of the courses outlined above. Dr. Ujor has access to 10-liter and 15-liter bioreactors, a gas chromatography machine, an HPLC machine and DNA and protein analytical apparatus by virtue of collaborations with Dr. Thaddeus Ezeji and Dr. Zhongtang Yu at the OARDC located on the Wooster campus; current students in the Renewable Energy – AS program benefit from this access to research apparatus as well as the close association of the OARDC with the Quasar Energy Group (<http://www.quasarenergygroup.com/>) and the Wooster municipal water treatment plant. These personnel and equipment will continue to serve students enrolled in the proposed AAS program without the need for additional injection of equipment or personnel.

- J. **Cost Accruing from the Proposed Major:** The proposed major will not result in additional costs to Ohio State ATI. Existing faculty (Regular and Associated) will continue to cover the teaching, research and mentorship requirements of the proposed program.
- K. **Faculty:** The proposed Bioenergy & Biological Waste Management - AAS program will be coordinated by Dr. Victor Ujor, who will also teach the majority of discipline specific courses included in the program. Over the past four years, Dr. Ujor worked as a postdoctoral researcher at the OARDC, where he studied bioconversion of agricultural and industrial waste residues such as plant biomass (wheat straw, corn stover, and energy crops), animal manure, industrial food processing wastes, and sugars resulting from rubber extraction from dandelion to biofuels (biogas, bio-butanol and bioethanol); exploring different fermentation technologies and metabolic engineering of select bacteria. Prior to this, Dr. Ujor worked on different projects including use of fungal enzymes for efficient detoxification of dye-containing wastewaters from the fabric industry, characterization of fungal enzymes involved in toxic waste management, bioconversion of agricultural wastes to laccase, an industrially applicable enzyme and bioremediation. Nathan Firestone will continue in his role and provide laboratory support. Nathan is chemist by training with over 4 years of experience. Having taught in the Renewable Energy – AS program since 2012, Nathan is well versed in laboratory techniques such as Chemical Oxygen Demand and Biochemical Oxygen Demand analyses, total nitrogen and phosphorus estimation, anaerobic digestion, coliform test, measurement of total and volatile solids, etc., which are relevant to the proposed AAS major.

## References

1. Water Research Foundation of America (2010). Water sector workforce sustainability initiative; Brueck T, Isbell M, O’Berry D, Brink P (ed.).
2. Operator Training Committee of Ohio (OTCO): [www.otco.org](http://www.otco.org).
3. Runge J, Mann J (2008). State of the Industry Report 2008: Charting the Course Ahead. *American Water Works Association* **100**: 61-74.
4. World Wide Fund for Nature <http://www.worldwildlife.org/threats/water-scarcity>. Accessed March 08, 2016.
5. US Environmental Protection Agency (EPA): <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>. Accessed March 06, 2016.
6. Renewable Energy for America: <http://www.nrdc.org/energy/renewables/ohio.asp>. Accessed, March 06, 2016.
7. Ohio Agriculture at a Glance:  
[http://www.ohiolivestock.org/Publications/OLC\\_CommodityFactCardMarch2010.pdf](http://www.ohiolivestock.org/Publications/OLC_CommodityFactCardMarch2010.pdf). Accessed March 06, 2016.