WILLIAM & MARY

Algae initiative aims to produce fuel while helping the environment

by Joe McClain | September 30, 2009

The College of William and Mary and its Virginia Institute of Marine Science have formed a collaborative research initiative to investigate a promising new technology to produce biofuel from the algae growing naturally in rivers and the Chesapeake Bay.

The enterprise, called ChAP—the Chesapeake Algae Project—is an integrated research approach to algae-based energy production and environmental remediation. It includes a number of corporate partners, notably StatoilHydro, a Norwegian energy company.

StatoilHydro has seeded the enterprise with an initial $3 million investment. Other key partners are the Williamsburg energy advisory firm Blackrock Energy, the University of Maryland, the Smithsonian Institution, the University of Arkansas and HydroMentia, a Florida company that works with water-treatment technologies.

“This is the kind of collaboration at which William & Mary excels,” William & Mary President Taylor Reveley said. “It is a powerful extension of our own drive toward a more sustainable campus community.”

StatoilHydro representatives met with William & Mary officials and other partners in Williamsburg recently to sign a formal agreement to proceed. Other partners, private and public, are expected to join the initiative as work progresses.

“By taking the first step in close cooperation with some of the most skilled researchers the U.S. has to offer in this field, we feel confident that we have the best starting point possible for reaching a successful result and a good basis for attracting new private and public partners in the future,” says Lars Nordli, head of StatoilHydro’s biofuel division.

The William & Mary/VIMS group is investigating a process that not only is environmentally sustainable, but if used on a large scale, can help to reverse a number of environmental problems such as excess nutrient enrichment that produces “dead zones” in the Chesapeake Bay and other waters.

However, Dennis Manos, William & Mary’s vice provost for research and graduate and professional studies, said the main environmental benefits of ChAP will derive from the central goal of the project: to find a way to produce algal biofuel on an industrial scale.

“We would like to help companies put a significant dent in the world’s thousand-barrel-per-second appetite for oil,” Manos said.

Lead researchers at VIMS involved in ChAP include J. Emmett Duffy, the Loretta and Lewis Glucksman Professor of Marine Science, and Professor of Marine Science Elizabeth Canuel. At the Williamsburg campus of William & Mary, Gene Tracy, Chancellor Professor of Physics and Applied Science; Bill Cooke, professor of physics; and Robert Hinkle, professor of chemistry, are lead members of the team, which includes other faculty members.

Manos explained that the project involves the entire process of producing biofuels, from algal growth to harvesting, extracting the oil and other projects from the algae, processing the oil and producing the final biofuel product.

The project was initiated by exploring, among others, technology originally developed by Walter Adey of the Smithsonian Institution as an efficient, large-scale aquarium filter. Adey has been meeting with a group of researchers at William &

Mary and VIMS for the past year, working out details of how to adapt the concept to industrial-scale algae cultivation. A test site has been operating at VIMS, using brackish York River water, and a second test station is planned for Lake Matoaka on the William & Mary campus.

Algae are good candidates for use as biofuel because of their rapid growth rates, ability to take-up nutrients such as nitrogen and phosphorus, and some of these aquatic plants have as much as 50 percent oil content, depending on environmental factors. ChAP differs from other algal biofuel initiatives in two ways.

“In the first place, we’re going to work with many species of algae, as opposed to concentrating on farming a monoculture, or attempting to contain genetically modified algae in open-water environments,” Manos said. Most current algae studies focus on one high-yield species or strain of algae, but Manos explained that using a polyculture approach makes the algae less susceptible to disease and generally more robust. One of the goals of ChAP will be to develop processes to maximize the effective energy yield from a harvest that varies in oil content.

The other difference is that the process is designed to work without competing with either fresh-water supplies or agricultural resources. “The process will work in brackish water, salt water, even waste water,” Manos said. “That’s one of the best parts of the whole idea, and ultimately, while producing affordable transportation fuel, using wild algae can even help to remediate conditions that otherwise would lead to harmful algal blooms.”