

NREL teams with Navy, private industry to make jet fuel from switchgrass

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The Energy Department's National Renewable Energy Laboratory (NREL) is partnering with Cobalt Technologies, U.S. Navy, and Show Me Energy Cooperative to demonstrate that jet fuel can be made economically and in large quantities from a renewable biomass feedstock such as switch grass.

"This can be an important step in the efforts to continue to displace petroleum by using biomass resources," NREL Manager for Bioprocess Integration R&D Dan Schell said. "We're converting biomass into sugars for subsequent conversion to butanol and then to JP5 [jet fuel](#)."

It's one of four biorefinery projects funded recently by the [Energy Department](#) as part of the Administration's efforts to support renewable biofuels as a domestic alternative to power military and civilian aircraft and vehicles

NREL's pretreatment reactor and enzymatic digester reactors will process switchgrass into fermentable sugars. NREL's 9,000-liter fermenters will then produce butanol from the sugars using Cobalt Technologies' proprietary microorganisms and fermentation process. A co-exclusive patent license agreement between the Navy and Cobalt Technologies is providing the technology and expertise for converting the butanol to jet fuel. Show Me Energy Cooperative of Centerville, Mo., will provide the switchgrass feedstock. Show Me Energy's headquarters also is a potential site for a new, larger biorefinery if the demonstration succeeds.

NREL will be combining its pretreatment, enzymatic hydrolysis, and fermentation expertise with Cobalt's promising microorganisms to produce the butanol intermediate, said David Sievers, R&D Engineer at NREL. Technology originating from Cobalt and the Navy will be used to turn butanol into jet fuel at the NREL biorefinery pilot plant. The process will use the Navy's unique catalyst systems.

The goal is to show that the Cobalt-Navy bio-jet fuel can be a cost competitive alternative that meets military specifications while using non-food based biomass as a feedstock, thus reducing the Department of Defense's dependence on petroleum-based products.

The results of testing will help determine whether the process is ready for commercial scale. If so, the U.S. Department of Agriculture and the Department of Defense are poised to help private firms build the huge biorefineries that would be needed, Schell said.

NREL has the equipment to convert biomass to fermentable sugars at a scale of one dry ton per day, using enzyme formulas and a dilute acid catalyzed pretreatment developed by Cobalt. Hemicellulose and cellulose sugars will be fermented simultaneously using three of NREL's 9,000 liter fermenters.

"At NREL, we can take biomass feedstock, convert it to biofuels and scale it up in our pilot plant, in this case converting it to butanol," NREL Senior Project Leader for Partnership Development Rich Bolin said.

"The (test) runs we did last year with [Cobalt](#) Technologies producing butanol at our [pilot plant](#) were quite successful."

The project could lead to big gains in jet-fuel manufacturing in the United States and a boost for jobs in rural America. Using [biomass](#) rather than [petroleum](#) offers the advantages of improved energy security, less price volatility and a smaller impact on the environment, Bolin said.

The process is expected to result in a 95% reduction in greenhouse gas emissions compared to the current production of jet fuel.

Provided by National Renewable Energy Laboratory

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