

TENNESSEE

Clean Fuels Advisor

A quarterly publication from the partnership between the Clean Cities coalitions in Tennessee and the state of Tennessee.



Bringing alternative fuels and hybrids to the forefront. Alt fuels = biodiesel, electricity, ethanol, hydrogen, natural gas and propane.

Biofuels Enlightenment - Zenalgae

In a bold move to bring algae-based biodiesel production to Tennessee in 2008, Northington Energy, LLC has acquired Zenalgae of Atlanta.

In the last couple of years, algae's herculean oil-producing characteristics have been under the microscope in more ways than one, as they can generate far more oil per acre than any of today's food or non-food crops. While soybeans—which are the main resource used today in the U.S. to provide an oil for making biodiesel—produce roughly 45-50 gallons of oil per acre, algae has the potential to produce 1,000 gallons of oil per acre... perhaps ten times that amount.

"Acquiring Zenalgae is the perfect fit for our company," said Lisa Horn, Northington's director of new business development. "Algae are the fastest growing plants in the world, and growing and harvesting them for biofuels production while reducing CO2 is key to our company's growth."



Algae oil production has been lauded by the Department of Energy as having a very promising future. Although most recent algae-based research has been done in the private sector, the DOE said in 1998 that experiments bear out that algae may be the only viable method for producing enough fuel to displace current world gasoline usage.

Algae, which reproduces itself and its oils every six hours, has created excitement in the biodiesel industry because of its potential to produce much more substantial yields per acre. It can be harvested day after day and can utilize almost any relatively flat land space.

The Zenalgae bioreactor will be installed at Northington's 8 acre, 15,000-square foot facility in Wartburg. The Zenalgae research and development facility will be relocated from Atlanta to the Knoxville/Oak Ridge area. For more info, visit <http://www.zenalgae.com/>.

State Provides Alt Fuels Innovations Grants to Local Governments & Public Universities

Local governments and public universities will soon be taking action to promote the production, distribution and use of alternative fuels in Tennessee through support of the state's "Innovations" grants. This summer Governor Phil Bredesen announced 14 recipients of this year's Innovations grants, collectively totaling more than \$880,000. These grants were developed to help local governments and public universities increase use of alternative fuels in their fleets and create public health benefits for their communities. Recipients will be using their grant dollars to install dedicated biofuels pumps for their fleets, create unique public information messages, develop new learning curriculum, produce biofuels from a variety of campus-based feedstocks and research cutting-edge energy topics. "I'm pleased to see the variety and innovation represented by these projects as we continue to expand the use and production of alternative fuels in Tennessee," said Governor Bredesen.

Alternative fuel Innovations grant recipients include the cities of Chattanooga, Kingsport and Oak Ridge, as well as Cleveland State Community College, East Tennessee State University, Middle Tennessee State University, the University of Memphis and the University of Tennessee. "Making cleaner burning

fuels more readily available to fleets while also providing additional education and research capacity for university communities is an important step in the right direction," said Environment and Conservation Deputy Commissioner Paul Sloan, who serves as co-chair of the Governor's Alternative Fuels Working Group. "I look forward to seeing a wide range of positive impacts resulting from these Innovation grants. It is particularly exciting to see local governments like Chattanooga already talking about how they will make their E85 pump available to other public sector fleets in Hamilton County."

Environment and Conservation is administering this Innovations grants for state government. For more information on these Innovations grants and alternative fuels activities in Tennessee contact Greg Riggs at 615-532-0567 or visit the BioTENN Web site at <http://www.biotenn.org/>.



Cleveland State looks to grow jobs in alternative energy for southeast Tennessee. Cleveland State Community College in Bradley County received \$84,000 to develop an Alternative Fuels Learning Lab in the newly proposed Cleveland/Bradley Energy Business Incubator that will house the college's Biodiesel Education Program. The college will develop a variety of programs and classes in alternative fuels production for students and small businesses. Funding will also help purchase necessary equipment to convert food waste products to biodiesel that will be blended into B20 fuels for campus vehicles. Partners from the college, local government and private industry have formed an Alternative Advisory Council to make sure that experience from energy related businesses in the region contribute toward and benefit from the instruction, development and research conducted through the Learning Lab.

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American Fuels Checklist:

1. Mention at your local fuel stations that you want them to offer biofuels to you, their customer.
2. Make the switch yourself to using a more fuel efficient vehicle, or an alternative fuel, or find another way to reduce your petroleum footprint.



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MLG&W Does the Right Thing

In late August, Memphis Light Gas and Water (MLG&W) made a particularly smart move: they cleaned a tank at one of their service centers and filled it with B20. MLG&W has been a founding partner of the West TN Clean Cities Coalition since 2005 and has been using alternative fuels for 24 years.

The Energy Policy Act (EPAAct) of 1992 requires fleets like MLG&W to acquire alternative fuel vehicles, which are capable of operating on non-petroleum fuels. In order to comply with their EPAAct mandate, MLG&W has been maintaining a natural gas vehicle fleet of 75 vehicles since 1995. Now with 1) the availability of locally produced high quality biodiesel and 2) educated and willing distributors, MLG&W is able to meet a portion of its EPAAct



mandate with biodiesel. At the moment MLG&W is using B20 at the Brunswick service station for over 250 vehicles and pieces of diesel equipment. MLG&W Transportation Supervisor Danny Willoughby has been active in alternative fuels since the early eighties and was instrumental in the decision to use B20. "Since August 23rd, we have had no problems with any of the vehicles or equipment using B20. We use over 12,000 gallons of B20 per month at the Brunswick station", said Willoughby. Ultimately, the utility plans to be able to use B20 at each of its seven service stations around Memphis and Shelby County. That would mean B20 in almost 2,000 vehicles and pieces of equipment... that would be good news for everyone in Shelby County.

City of Jackson - Sold on Biodiesel

Rodney Todd, fleet manager for the City of Jackson, is "sold on biodiesel." "We've been using B10 since August of 2006 and haven't had a problem...our next load will be B20." Todd and the City of Jackson did not accept biodiesel right away. "In the beginning, I was a little skeptical. I've been working with diesels for a long time. We looked into biodiesel for about a year before we ever put a drop into our tanks. We went to Clean Cities meetings, met with distributors, and met with the Department of Agriculture and just about anyone who knew something about biodiesel. We've been sold on the product for over a year now, and are ready to start using more." As of November, the city was using about 6,000 gallons of B10 per month in roughly 200 vehicles and pieces of equipment. "There's biodiesel in every diesel we've got... fire trucks, haulers, tractors, generators, you name it," says Todd.

The City of Jackson put in three 12,000-gallon tanks around the same time they began using B10 and

did so with the use of other alternative fuels in mind. Todd had this to say about the city's willingness to use alternative fuels: "Biodiesel works for us right now because we can use the same tanks we would use if we were using just ultra low sulfur diesel. Thanks to the way our new tanks are set up, as ethanol becomes available in West Tennessee, we will be ready and able to begin using it with a minimum of expense... the city was looking ahead when they put in those tanks."

It is great to see public leaders take the initiative on alternative fuel decisions! We applaud the City of Jackson for its willingness to try new things and to share the details of their experience with us. Keep up the good work!



The Science of Money, the Language of Business

Have you got a great idea that just needs to be funded? Do you have a business with a good plan, including something biofuels related, but need some help moving forward? Has your university unlocked a technological secret, but just can't seem to turn that into a product or service?

Well, if you answered yes to any of those questions, there is a new resource in Memphis that might just be able to help.



Innova Inc., a venture capital firm born from the non-profit Memphis Bioworks Foundation, has just recently opened its doors to help find, fund, and grow small science-based companies. When asked about the company's vision, Ken Woody, president of Innova, Inc. said, "The focus is on transforming innovation to commercialization. Innova will evaluate new product

and service offerings from start-up companies, assist universities and researchers in technology transfer for new innovative ideas, and educate entrepreneurs on how to best grow their businesses. Our goal is to find entrepreneurs with new ideas, products or services, fund the best ones, and grow them to the state of commercial success."

In the few weeks since its inception and start-up date, Innova has been busy. Over 15 different firms have sought out the help of Innova, all hoping to get a shot at some of the \$11.5 million promised by the Memphis Fast Forward economic development plan. To learn more about Innova, discuss your ideas, or make a proposal, please visit <http://www.innovamemphis.com> or email Ken Woody at kwoody@innovamemphis.com.



Middle Tennessee - David Pelton

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Dear Dave: the Cost of Ethanol

Dear Dave,
Why is the price of ethanol higher in Georgia than it is in Kentucky?
-Ron, Hopkinsville, KY

Ron,

Let me start off with some background info. Bio-fuels like ethanol are moved around the country via trucks, trains, and barges. However, petroleum primarily moves long distances via transcontinental pipelines to large regional storage facilities (terminals) where your local fuel supplier picks up a truckload at a time for the final few miles of transport. This difference certainly adds to the final cost of biofuels.

Now more to your question. As an example, you have an ethanol plant in your town of Hopkinsville. Ethanol there is cheaper than it is in my hometown of Nashville primarily due to the transportation cost. To bring that same fuel all the way to Georgia adds even more to the cost. To that point, there are very few ethanol production facilities in the southeast which means most of the ethanol sold in the southeast comes from the midwest.

Why can't ethanol use the same pipelines petroleum uses? Two main reasons: first, the volume isn't

quite high enough yet. Ethanol still makes up a small percentage of total fuel consumption. Second, and perhaps more importantly, ethanol attracts water. Largely due to condensation, small amounts of water are



found in the pipeline. The industry knows how to deal with this problem for petroleum-based fuels but not yet for ethanol. Since ethanol, basically an alcohol, pulls the water out of whatever it touches (kind of like a college

drinking binge dehydrates a student) it makes for a big hurdle in the ethanol-in-the-pipeline transportation effort.

One of the solutions is to build more localized ethanol plants. In order to do this we need to break away from just corn-based ethanol and use whatever feedstocks are local, be they switchgrass, sugarcane, or even municipal waste.

First in the Nation

The City of Franklin rolled out a new hybrid transit bus on November 19. The trolley-style bus is the first of its kind in the nation made by Gillig. Franklin Transit, Clean Cities of Middle Tennessee, the TMA Group, and the State Energy Office all partnered to bring the hybrid vehicle to middle Tennessee. Clean Cities secured a \$200,000 special projects grant from DOE which paid for the incremental cost of the hybrid technology.

"This kind of partnership is a great step for the state and for middle Tennessee" said the state energy office's Director of Energy Policy Ryan Gooch. "It is the kind of thing we would like to see more of."

Debbie Henry, interim director of the TMA Group, talked about the environmental benefits of not only the hybrid technology but also using biodiesel in the entire Franklin Transit fleet. "The hybrid technology gives the bus 30-40 percent better fuel economy, which is important with rising petroleum costs. That

fuel economy also leads to less air pollution. At the same time the addition of biodiesel in the fuel mix makes the emissions even cleaner." Franklin Transit has been using a B20 blend in its entire fleet since its inception over four years ago.

The hybrid bus arrived just in time for Franklin's busy holiday season. The trolley-style busses are popular amongst shoppers, tourists and residents who cannot or do not drive themselves. On occasion, the trolleys are rented out for special events and holiday tours.

Nashville Metro Transit Authority (MTA) will handle maintenance on the new hybrid. This is a good match since MTA already has a fleet of Gillig buses and has experience using biodiesel in its own fleet. According to MTA's Director Paul Ballard, "Metro is very interested in the environmental benefits of the hybrid technology and looks forward to the Franklin partnership."

(l-r) State Energy Policy Director Ryan Gooch speaks to the crowd at the unveiling of Franklin's new hybrid trolley-style bus; the new hybrid Gillig trolley. The bus gets 30-40 percent better fuel economy and will also run on B20.





UTBI Receives National Attention

Contributed by Patterson Wilson of the University of Tennessee Office of Bioenergy Programs.

As part of the Biofuels Initiative, the University of Tennessee and their technology partner Mascoma Corporation are working together to build the first switchgrass-to-ethanol biorefinery in the United States... and the nation is taking notice.

The Biofuels Initiative, and the \$70 million allocated to it by Governor Bredesen, has made headlines around the U.S., including coverage on NBC Nightly News and on National Public Radio (NPR).

Recently, the NBC Nightly News alternative energy series 'Our Planet' devoted a night of coverage to cellulosic ethanol and switchgrass. An NBC camera crew traveled to Paris, Tennessee to film this season's

switchgrass harvest and to talk with west Tennessee farmers about growing the crop. The video segment touched on the advantages of producing switchgrass as an energy crop, which include its perennial nature, its drought tolerance, and its ability to achieve high yields on marginal land generally not used for producing food.

The Bryant Park Project is a two-hour morning news program on NPR. After reading about the UT Biofuels Initiative, host Luke Burbank conducted an on-air interview with Dr. Kelly Tiller, director of External Operations for the Biofuels Initiative. Video clips and transcripts of the coverage can be seen on the Office of Bioenergy Programs web site at <http://www.UTbioenergy.org/TNBiofuelsInitiative/>.



Blake Brown, director of UT's Milan Research Center, is pictured in a three year-old switchgrass field. When mature, switchgrass can reach heights of up to 10 feet.

Ethanol Workshops Share Quality Information

The state of Tennessee held two ethanol quality workshops in Knoxville and Nashville in late November. These workshops were part of a series intended to disburse correct and concise information on the need for focusing on quality in biofuels all the way from production through storage and dispensing at the retail level. A complementary biodiesel quality workshop was held in Nashville in August.

Randy Jennings with the Department of Agriculture took the lead role in organizing the two ethanol workshops and worked with a team that included other state departments, the Tennessee Oil Marketers Association, the Renewable Fuels Association (RFA), Marathon Petroleum and the state's Clean Cities coalitions.

The RFA played a large part in the effort making about five presentations at each workshops that spanned product specifications and system preparations for using ethanol to ensuring proper blending and discussing the all-important issue of phase separation. One key topic that was addressed repeatedly is the precautions that need to be taken at the onset of using any blend of ethanol to ensure that no water is currently in or getting into the tank or pumping system. Bob Reynolds, the technical lead for the RFA,

mentioned quite a few times that a fuel supplier really cannot do ethanol right unless you do the up-front work to ensure that water is not in the system.

Other presenters like Marathon showed how they blend E10 or E85 at their terminal locations in Nashville and Knoxville and how that eases the job of the driver due to all-inclusive electronics that simply allow the driver to select what blends he wants — all the necessary blending and additization is handled by the mechanical filling system. Karl Doenges of CleanFUEL Distribution showed the various types of new and retrofit equipment they offer to help station owners make an easy switch to offering ethanol blends, and Jonathan Overly and Linda Tidwell provided information on state grants that are available to help offset the costs of offering E85.



A snapshot of the roughly 50 people that attended the Knoxville workshop. Both workshops were well attended and lots of questions were asked clearly showing interest by the attendees in learning the right way to handle ethanol.

Alt Views: Gary Lykins Sharing Your Stories on Using Alternative Fuels

"There is not ONE good reason to use biodiesel." This is a phrase anyone who embarks on a mission to start using biodiesel is likely to hear. I always say "That's true... there are many good reasons to use biodiesel!" The environmental impact is evident and the impacts on the economy and national security are awe-inspiring.

Thanks to a very cooperative Board of Mayor and Aldermen, the Town of Jonesborough allowed me to oversee moving the town's mobile diesel fleet to a B20 biodiesel blend during the latter part of 2006. There were reservations, but the changeover went better than expected: no mechanical trouble, no

filter damage, no gelling in the tank. The hardest thing to overcome was the uncertainty from the general public. If one is reading the ETCFC newsletter it's a pretty safe bet that they are a proponent of cleaner fuel and likely have at least a cursory knowledge of the environmental benefits. The rest of the population is either neutral or just against the whole idea of a bunch of "environmentalists" getting involved in the fuel supply chain. Due to these attitudes I recommend that we—the advocates of clean fuels—educate ourselves and each other on the many benefits of using renewable, homemade energy resources.



Gary Lykins has been the shop supervisor for the city garage in Jonesborough since 2005. His proactiveness helped the town make the switch to biodiesel in 2006.



Tri-Cities Biofuel Grants Now Open

Thanks to an opportunity through TDEC and a connection from Steve Gossett of Eastman, the ETCFC is administering roughly \$60,000 in grants to public stations owners in Sullivan and Washington Counties who are interested in offering E85 or B20 to their customers.

The grant period opened in December and offers up to \$4,000 to convert a tank and pump over to B20, or up to \$12,000 for converting equipment to offer E85.

The ETCFC has leaned heavily on TDOT for leadership on contracting and proposal creation.

While offering less than what TDOT is making available through the state funding for such conversions, the goal of this project was to find station owners who just want to convert (versus install new equipment) so that the funding can do more for less. Our hope is to fund four B20 and three E85 pumps.

If you are interested in more information, see the ETCFC homepage - <http://www.ETCCleanFuels.org/>.

East Tennessee - Jonathan Overly
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ETZC to be East Tennessee's Largest B20 User

The East Tennessee Zinc Company (ETZC), which reopened operations in East Tennessee in March 2006, has moved to using biodiesel.

ETZC operates three underground zinc mines that are located in Jefferson (2) and Knox (1) Counties. Each mine uses anywhere from 20-70 pieces of heavy-duty equipment to mine, collect, process, and transport zinc ore to the surface. The final product (a 62 percent zinc concentrate) is processed domestically into zinc metal. Currently, two of the mines are open (the two in Jefferson County).

After several discussions with the ETCFC and consulting some other sources, the company decided to start moving their diesel equipment over to a B20 blend. "We need to reduce emissions and using biodiesel seems like a really good idea based on all the additional benefits that are gained," says Tom Kirkpatrick, the environmental manager for the company. He continues, "We are hoping that all goes smoothly with this so that we can look at the feasibility of higher biodiesel

blends. With a constant temperature of 58 degrees F underground, the typical jelling issues during wintertime above ground shouldn't be a problem for us."

Due to the fact that some equipment was older, and due to biodiesel's cleaning abilities, they decided to purchase new underground fuel tanks and clean the surface tanks. The surface tanks feed fuel down into the mine tanks through fuel lines that run approximately 600 feet down to the intra-mine refueling area. All equipment refuels underground.

The Young Mine in New Market is the only one currently using B20, but Kirkpatrick is working to transition the other two mines over to B20 as well. With an estimated 750,000 gallons of diesel consumed per year in all three mines once fully operational, their annualized use of B20 will put them in the lead as the largest user of B20 in our region.



Challenge X, Year 4 - Focus on Durability

Student innovations in sustainable mobility is what Challenge X is all about, and this year's final vehicle design competition will put that message to the test.

"Challenge X is a student-led sustainable vehicle design competition sponsored by General Motors and the Department of Energy that focuses on increased fuel economy, reduction of greenhouse gas emissions, and displacing petroleum use while maintaining the functionality and performance of the base vehicle, a 2005 Chevrolet Equinox," said Scott Curran, UT Challenge X team leader.

Over the past three years of competition, the student-led team at the University of Tennessee, one of only 17 universities participating in the four-year competition, has built a biodiesel-powered electric hybrid from the ground up. Affectionately called the "Revolution X," the vehicle runs on B20 and uses a Nickel Metal Hydride (NiMH) battery pack, which have helped to increase fuel economy by 30 percent, while also reducing greenhouse gas emissions.

Focusing on durability and sustainable mobility education in the final year of competition is key, and the UT team has worked on creating a marketing plan and outreach presentation for competition.

"Our marketing plan focused on East Tennessee and helped us receive the first of two \$2,500 grants, which will be used for sustainable outreach materials such as organic T-shirts, recycled pens and brochures printed on 100 percent post-consumer fiber," said Amanda Womac, UT Challenge X outreach coordinator.

Team members Curran, Womac and Sean Peterson, team co-leader, traveled to California November 29 for the first stage of competition, which included an outreach presentation for a chance to win the second \$2,500 grant and a road rally from Los Angeles to Anaheim, where the vehicle will be showcased at the Electric Vehicle Symposium.

The next sustainable vehicle design challenge sponsored by GM and DOE is EcoCAR and will be officially announced in early December at the Symposium in California.



The year four Challenge X logo is shown above while UTK's vehicle -- the "Revolution X" -- is shown below.



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Just visit www.biotenn.org to get the latest on alt fuels' action in Tennessee.

Support alternative fuels... and your state's Clean Cities coalitions!

The state of Tennessee's Clean Cities coalitions serve an important role: local champions for change. All three coalitions serve their respective areas with assistance in helping fleets move to using alternative fuels. See any of our Web sites to find out how you can become a member and get involved at the local level to help bring about change in your community!



www.WTCCC.com



www.TennesseeCleanFuels.org



www.ETCleanFuels.org

Major Partners in Tennessee's Clean Cities Coalitions

Tennessee Department of Economic and Community Development, Energy Division
Tennessee's Interagency Alternative Fuels Working Group

Memphis Biofuels **Memphis Light, Gas, & Water**

Valero Energy Corporation
MATA Transit

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