

North Carolina 2008 Clean Fuel and Advanced Transportation Technology Options

Biodiesel

Biodiesel is a clean burning alternative fuel, produced from domestic, renewable resources. Pure biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. Biodiesel can be used in any compression-ignition (diesel) engines with little or no modifications. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics. Biodiesel also helps diversify our nation's fuel supply and supports energy security initiatives by being domestically produced.

B20 (20 percent biodiesel and 80 percent petroleum diesel) and higher blends are widely available in North Carolina through a State Purchasing Contract (<http://www.doa.state.nc.us/PandC/dynfuels/fuelcost.asp>) in all 100 NC Counties and network of local producers and distributors.

Biodiesel fact sheet and NC biofuel retail & distributors: www.cleantransportation.org under Fact Sheets
National Biodiesel Board: www.biodiesel.org

Ethanol

Ethanol is a renewable, domestic, environmentally preferable fuel that enhances the nation's economy and energy independence. There are two ethanol blends used in NC:

- **E10** is a premium blend of 10% ethanol with 90% gasoline and can be used in any gasoline vehicle.
- **E85** is an 85% blend of ethanol with 15% gasoline used in flexible fuel vehicles (FFVs) that operate on E85 and/or gasoline. There is no additional cost to purchase a FFV as compared to the same gasoline model.
- **Both E10 and E85** are available to local government, school systems and state government fleets through a state purchasing contract in all NC counties (<http://www.doa.state.nc.us/PandC/dynfuels/fuelcost.asp>).

2008 E85 Flexible Fuel Vehicles (highlighted vehicles are on state purchasing contract)

Sedan	Chrysler	2.7L Sebring
Sedan	Dodge	2.7L Avenger
Sedan	Mercedes	3.0L C300 Series
Sedan	Ford	4.6L Crown Victoria
Sedan	Lincoln	4.6L Towncar
Sedan	Mercury	4.6L Grand Marquis
Sedan	Chevrolet	3.5L Impala
Sedan	Chevrolet	3.9L Impala (police units)
SUV	Chrysler	4.7L Aspen
SUV	Dodge	4.7L Durango
SUV	Jeep	4.7L Commander
SUV	Jeep	4.7L Grand Cherokee
SUV	Buick	3.9L Terrazza
SUV	Chevrolet	5.3L Avalanche
SUV	Chevrolet	3.9L Uplander

SUV	Chevrolet	5.3L Tahoe, Suburban
SUV	GMC	5.3L Yukon, Yukon XL
SUV	Nissan	5.6L Amada
Minivan	Chrysler	3.3L Town and County
Minivan	Dodge	3.3L Grand Caravan
Minivan	Chevrolet	3.9L Uplander
Van	Chevrolet	5.3L Express
Van	GMC	5.3L Savana
Pickup	Dodge	4.7L Dakota
Pickup	Dodge	4.7L Ram
Pickup	Ford	5.4L F-150 (3-valve)
Pickup	Chevrolet	5.3L Silverado (V8)
Pickup	GMC	5.3L Sierra
Pickup	Nissan	5.6L Titan

NC Ethanol fact sheet and NC biofuel retail & distributors: www.cleantransportation.org under Fact Sheets

American Coalition for Ethanol: www.ethanol.org **National Ethanol Vehicle Coalition:** www.e85fuel.com

Compressed Natural Gas (CNG) & Propane (LPG)

CNG and LPG are considered low carbon fuels and are the cleanest fossil fuels. Compared to gasoline and diesel, their use could bring about a significant reduction in tailpipe emissions of carbon monoxide (about 70%), nitrogen oxides (about 85%), and ozone-causing pollutants (about 90%). Honda is the only company that manufactures a light duty dedicated CNG vehicle. Currently most light duty CNG vehicles are up-fitted by companies that have received certification by the U.S. EPA. In addition, many trucks and buses are factory built or available through distributor/OEM relationships.

Honda Civic GX (OEM CNG vehicle) NC dealers:

- Apple Tree Honda, Asheville NC: contact Jason Locke (828) 651-8639
- Flow Auto, Winston Salem: contact Joe Busek (336) 785-3380
- Hendrick Honda, Charlotte: contact Terry Moore (704) 552-3351

EPA Certified conversions to CNG and LPG

<p>BAF Technologies www.BAFtechnologies.com Bill Calvert (214) 231-1450 ext 458 bcalvert@baftechnologies.com MY 2006-08 Ford Crown Vic, Mercury Marquis, Lincoln Town Car 2007-2008 Ford E350 van 5.4L engine 2008 Ford F150, F250, F350 5.4L engine up to 13,000 GVW 2005-2008 E450 6.8L engine</p>	<p>Baytech Corporation www.baytechcorp.com Rebecca Royer (650) 949-1976 6.0L L/M/HD (GM, Isuzu, Workhorse – pick-ups, vans/stepvans, Cab forward, Cutaways) 8.1L (Topkick, cutaways)</p>
<p>Cummins Westport www.cumminswestport.com Bill Boyce (330) 534-8352 5.9L “B Gas Plus” – 195-230hp 8.9L “ISL-G” – 250-320hp (replaces 8.3L “C Gas Plus” and 8.9L “L Gas Plus”) NC Distributor: Cummins Atlantic Greg Campbell (864)-208-2657</p>	<p>Westport Innovations Jonathan Harris (614) 718-2043 jharris@westport.com 15L “ISX-Gas” – 450hp (LNG only)</p>
	<p>Emission Solutions Ira Dorfman (202) 255-6050 idorfman@emissionsolutionsinc.com CNG replacement of 7.6L International DT466 engine with Phoenix NG – 175-265hp</p>

Conversion engine & station installer

Refueling Infrastructure

<p>Transeco Energy www.transecoenergy.com Installs vehicle conversion units & builds refueling stations. Planned 2008 EPA approved CNG systems; Ford Focus, F-150 5.4 L V-8, GM 6.0 L V-8 pick-up, & Yale Fork-lift Larry Abbott (828) 654-8300 Mobile: (828) 318-5651</p>	<p>FuelMaker www.fuelmaker.com Paula Herbert 800-898-3835, usinfo@fuelmaker.com</p>
	<p>Clean Energy Mark Riley (603) 318-6817 mriley@cleanenergyfuels.com</p>

- List of CNG businesses and services:* www.ngvc.org/buz_dir/index.html
More about CNG vehicles: www.eere.energy.gov/afdc/fuels/natural_gas.html
CNG vehicle manufacturers and up fitters: www.ngvc.org/mktplace/factsheets.html
Propane vehicles and equip: www.propanecouncil.org/trade/fleet/index.cfm
Information about NC CNG filling stations: www.daq.state.nc.us/motor/cng/

Hybrid Electric Vehicles

Hybrid-electric vehicles (HEVs) combine the benefits of gasoline engines and electric motors that are configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools. Eco Vehicles (www.ecovehicle.com) will complete hybrid electric retrofits.

2008 Hybrid Electric Vehicles (^available on the state purchasing contract)

Compact	Mid-size (con’t)	SUV (con’t)
1.3L Honda Civic (43 mpg)	1.5L Toyota Prius^ (47 mpg)	3.3L Lexus RX 400h (25 mpg)
3.5L Lexus GS 450h (24 mpg)	2.4L Toyota Camry^ (34 mpg)	2.3L Mazda Tribute (32 mpg)
		2.3L Mercury Mariner (32mpg)
Mid-size	SUV	3.3L Toyota Highlander (29 mpg)
2.4L Chevy Malibu (28 mpg)	6.0L Chevy Tahoe (21 mpg)	2.4L Saturn Vue (29 mpg)
5.0L Lexus LS 600h (21 mpg)	2.3L Ford Escape (32 mpg)	
2.4L Saturn Aura (28 mpg)	6.0L GMC Yukon (21 mpg)	
		<i>*Combined MPG reflects city & hwy driving</i> www.fueleconomy.gov/feg/hybrid_sbs.shtml

Heavy Duty Hybrids such as hybrid trucks and hybrid buses are showing improved fuel efficiency, while simultaneously reducing vehicle emissions. Heavy-duty trucks can easily be hybridized and can positively impact fuel economy and emissions. There are several different hybrid buses available that can be used in shuttle, transit, school and trolley applications. Vendors include;

BAE Systems www.hybridrive.com	GM-Allison www.allisontransmission.com
Ebus www.ebus.com	DesignLine www.designlineinternational.com
ISE Corp www.isecorp.com	National Bus Sales www.nationalbussales.com
Orion www.orionbus.com	Trolley Enterprise www.trolleyenterprises.com

Electric Drive Transportation Association: www.electricdrive.org **hybridCARS:** www.hybridcars.com
HEV Cost Calculator Tool: www.eere.energy.gov/afdc/vehicles/hybrid_electric_calculator.html

All-Electric Vehicles

A full-size **all-electric vehicle** is powered entirely by electricity, can be operated on all roads, and can be charged in a wall outlet with either 110 or 220 volts. Two manufacturers offer all-electric vehicles including: Miles Automotive Group, www.milesev.com and Hybrid Technologies, www.hybridtechnologies.com.

Low Speed Vehicles

A **Neighborhood Electric Vehicle (NEV)** is a Low-Speed Vehicle (LSV) with top speeds of 20 to 25 miles per hour that complies with certain U.S. National Highway Traffic Safety Administration (NHTSA) standards. North Carolina allows NEVs to be operated on streets and highways where the posted speed limit is 35 mph or less. NEVs can be titled and licensed as private passenger vehicles.

Low speed vehicles (LSV) that are not NEVs may take the place of conventional vehicles in certain settings. These vehicles are not plated and permitted on public streets. These vehicles help reduce petroleum consumption and emissions by operating on biodiesel, electricity, propane and/or compressed natural gas.

On state contract: a number of low speed utility vehicles with a diesel engine option and NEVs are available on the state contract (Term contract o70N at <http://www.gemcar.com/locate/stateDealers.asp>)

NEV & LSV Manufacturers:

Columbia Par Car Company www.parcar.com

Cushman, www.cushmanco.com

Dynasty Electric Car, www.itiselectric.com

E-Ride Industries, www.e-ride.com

Global Electric Motorcars, LLC www.gemcar.com

Miles Automotive Group, www.milesev.com

Motrec www.motrec.com (industrial uses)

Vantage www.vantagevehicle.com

Westward Industries www.westwardindustries.com

Zenn Motor Company www.zenncars.com

B.I.G. Man www.bigmanev.com (LSV only)

Eco Vehicles www.ecovehicle.com (LSV only)

Tiger Truck, LLC www.tigertruck.com (LSV only)

NEV & LSV Distributers:

Bleecker Electric Car Co. www.theelectriccarco.com

Contact: Steve Shattuck, (800) 849-3495

Global Electric Motor (GEM) 7 NC distributors:

<http://www.gemcar.com/locate/stateDealers.asp>

Carolina Industrial Equipment, Inc. Contact: John Yoxtheimer, (800) 476-2434]

NHTSA safety standards for NEVs and LSVs: www.nhtsa.dot.gov/cars/rules/rulings/lsv/lsv.html

Diesel Retrofit Technologies

Diesel retrofit technologies are pollution control devices designed to reduce harmful exhaust emissions on existing diesel engines. The most common retrofits are **diesel particulate filters (DPFs)**, **diesel multi-stage filters (DMFs)**, and **diesel oxidation catalysts (DOCs)**. DPFs are ceramic devices that collect particulate matter in the exhaust stream. DPFs must be used in conjunction with ultra low sulfur diesel (ULSD) and result in a 60 to 90 percent reduction in particulate matter (PM), hydrocarbons (HC), and carbon monoxide (CO). A DMF is a two stage metallic filter consisting of alternating layers of a corrugated metal and a porous sintered metal fleece, which must be used with ULSD. DMFs reduce PM, HC and CO emissions by 50 percent and nitrogen oxide emissions by 20 percent. DOCs are devices that use a chemical process to break down pollutants in the exhaust stream into less harmful components. DOCs can reduce emissions of PM by 20 percent and HC by 50 percent and CO by approximately 40 percent. When possible, a **closed crankcase ventilation system (CCV)** that further reduces emissions of hydrocarbons and particulate matter produced from the engine crankcase or oil pan area should be combined with a DPF or DOC to further reduce emissions.

The U.S. Environmental Protection Agency (EPA) and California Air Resources Board (CARB) have verification processes for the approved use of diesel retrofit technologies.

For a list of **EPA verified technologies** see: www.epa.gov/otaq/retrofit/verif-list.htm

For a list of **CARB verified technologies** see: www.arb.ca.gov/diesel/verdev/vt/cvt.htm

EPA or CARB Verified Technologies available to the North Carolina market

<p>Caterpillar Emissions Solutions www.cat.com/emissionssolutions Brett Alkins, 704-752-1314, alkins_brett_d@cat.com <i>Particulate Filters</i></p>	<p>Clean Diesel Technologies www.cdti.com Glen Reid, 203-327-7050, greid@cdti.com <i>Multi-stage Filters, Oxidation Catalysts</i></p>
<p>Cummins Emission Solutions www.cummins.com Mike Brand, 812-377-3752, michael.s.brand@cummins.com <i>Oxidation Catalysts with Closed Crankcase Ventilation</i></p>	<p>Cleaire www.cleaire.com Tom Swenson, 916-689-0248, Tom.swenson@cleaire.com <i>Particulate Filters</i></p>
<p>Donaldson Company, Inc. www.donaldson.com/en/exhaust/emission John Garrett, 952-887-3898 john.garrett@donaldson.com <i>DPFs, DMFs, DOCs, DOCs with CCV</i></p>	<p>DCL International Inc. www.dcl-inc.com Tony Almeida, 800-872-1968 x268 talmeida@dcl-inc.com <i>Particulate Filters</i></p>
<p>Engine Control Systems, Inc. www.enginecontrolsystems.com Dana Brewster, 440-840-2511, dabr@enginecontrolsystems.com <i>DPFs, DOCs, DOCs with CCV</i></p>	<p>Extengine Transport Systems www.extengine.com Richard Carlson, 714-774-3569, rcarlson@extengine.com <i>Oxidation Catalysts</i></p>
<p>International Truck Engine Corp. www.greendieseltechnology.com John Macaluso, 386-334-4863, john.macaluso@navistar.com <i>Particulate Filters, Oxidation Catalysts</i></p>	<p>PUREM North America, LLC Larry Dimitrievski, larry.dimitrievski@purem-na.com 313-592-5883, <i>Particulate Filters</i></p>

EPA's Clean School Bus Program www.epa.gov/otaq/schoolbus/index.htm

Environmental Defense's Cleaner Diesel Handbook www.cleanerdieselhandbook.org

Manufacturers of Emission Controls Association www.meca.org

Southeast Diesel Collaborative www.southeastdiesel.org *Diesel Technology Forum* www.dieselforum.org

Motor Oils

Three options are available for replacing conventional petroleum based motor oils. **Synthetic** lubricants flow at lower temperatures providing better cold-temperature starts and has more stable viscosity to reduce engine wear at high temperatures. The increased cost of synthetics is worth the investment for severe driving conditions. Producers can **re-refine oil** to remove contaminants and replace the additive packages that confer its specific properties, such as viscosity. American Petroleum Institute (API) approved re-refined oil is subject to the same stringent refining and performance standards as virgin oil, and is available at a similar cost. **Bio-based motor oils**, created primarily from canola or soy oils, offer another alternative to petroleum motor oils and high-end performance characteristics similar to that of synthetics. They are also the most "environmentally friendly" of the motor oils available, maintaining properties of non-toxicity and biodegradability, but their limited availability increases its cost.

State agencies can be procure synthetic and re-refined motor oil from:

North Carolina Correction Enterprise www.doc.state.nc.us/EPRISE/products/oillubes.htm#motor

American Petroleum Institute Oil Recycling www.recycleoil.org

Conservation

Reducing fuel consumption, or conservation, is an important strategy for meeting petroleum reduction goals.

1. Establish a fuel-efficient vehicle procurement policy
2. Keep fleet vehicle tires properly inflated, aligned, and use low rolling resistance (LRR) tires
3. Utilize teleconferencing, videoconferencing, and webinars for meetings and workshops
4. Provide transit incentives for employees to ride public transit and offer ride sharing incentives.
5. Get regular tune-ups, filter changes and engine lubes.
6. Offer employees a telecommuting option.
7. Offer safe bicycle storage; arrange safe bicycling instruction.
8. Require fleet vehicles cars be driven at posted speed limit.
9. Encourage combining multiple out-of-office errands/trips.
10. Establish idle reduction policies; eliminate unnecessary idling
11. Educate Employees and the Public

Fuel Economy Tips: www.fueleconomy.gov/feg/drive.shtml

Fuel Saving Tips: oee.nrcan.gc.ca/english/saving-fuel.cfm

Contact for more information

Anne Tazewell

Clean Transportation

(919) 513-7831

CleanTransportation@ncsu.edu

