

# ENERGY EXCHANGE

A publication of the National Energy Education Development Project

JAN-FEB 2003

## Mark Your Calendars!

### 2003 Summer Conferences

The 2003 NEED Energy Conferences for Educators are scheduled for:

**July 12-16: Chicago, IL**

**July 19-23: Galveston, TX**

**July 26-30: Denver, CO**

The conferences focus on providing classroom teachers and non-formal educators with the energy content knowledge and methods to teach comprehensive energy units using hands-on activities designed to develop students' critical thinking skills. The conferences also prepare participants to facilitate NEED workshops and introductory training programs in their local areas.

The conference brochure and preliminary agenda will be mailed out in late January. They are also available to download from our website at [www.need.org](http://www.need.org). If you are interested in attending one of the conferences or in sponsoring teachers to attend, please contact Mary Spruill ([mspruill@need.org](mailto:mspruill@need.org)).

### 2003 Youth Awards Ceremonies

Get your students motivated and start planning your Youth Awards projects now! Establish goals, take pictures and document your energy activities in a student-designed scrapbook. The projects are due to state coordinators or NEED Headquarters on April 15, 2003.

Every school that participates in the Youth Awards program is eligible to come to Washington for the National Recognition Ceremonies to be held June 20-23, 2003. Students and teachers can meet their energy-excited counterparts from across the country.

Information on how to put together your scrapbooks and the necessary forms are available in NEED's **Projects and Activities** booklet, as well as on our website at [www.need.org](http://www.need.org).

## Research Opportunity for Teachers

The National Renewable Energy Laboratory's (NREL) Office of Education offers an opportunity to K-12 science, mathematics, and technology teachers to revitalize their research interests and skills. Participants conduct supervised, state-of-the-art renewable energy research and participate in professional development as summer research associates.

Researchers at NREL are committed to developing renewable energy and energy efficiency technologies that benefit the environment and the economy and provide solutions to the future energy challenges of the U.S. and the world.

The Laboratory Science Teacher Professional Development (LSTPD) Program, formerly known as TRAC, provides teachers with professional, science, and technological research experiences through an eight-week summer research appointment at NREL. In addition, resources and scientific consultation are provided to the teachers for at least three years.

Teachers develop educational units to relate their experiences to the classroom. Successful participants will be invited to continue their research experience the next summer. Participating teachers receive a stipend of \$800 per week, travel expenses beyond 50 miles from NREL, and a housing allowance of \$150 per week. Graduate-level recertification credit is also available.

LSTPD Teacher Research Associates are appointed on a competitive basis. Applications must be post-marked by February 28, 2003. For more information about the program or for an application form, go to [www.nrel.gov/education/lstpd.html](http://www.nrel.gov/education/lstpd.html).

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*The NEED Project is a 501(c)(3) nonprofit education association providing professional development, innovative materials correlated to the National Science Education Content Standards, ongoing support and recognition to educators nationwide.  
A list of NEED sponsors is available on our website and in our Annual Report.*

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Educators may reproduce articles and activities for classroom use.

# CALENDAR OF EVENTS

For more information, email [info@need.org](mailto:info@need.org) or call 1-800-875-5029

## January 2003

- 6 New Mexico NEED Workshop – Roswell, NM
- 9/10 Rhode Island NEED Workshops – Cranston, RI
- 18 Plaquemines Parish NEED Workshop – Belle Chase, LA
- 22 Massachusetts NEED Workshop – Medford, MA

## February

- 5 ILEED Workshop – Highland, IL
- 7 Rhode Island NEED Multilingual Workshop – Cranston, RI
- 25 California NEED Workshop – Carpinteria
- 27 California NEED Workshop – Carpinteria
- TBA Rhode Island EnergySmart Schools/NEED Workshops – Providence, RI
- TBA Illinois Energy Training Certification (ETC) – Rolling Meadows, IL

## March

- 1 Applications for the Kentucky NEED Schools Going Solar Program Due
- 7-8 West Virginia NEED Conference – Morgantown, WV
- 11 Western North Carolina EnergySmart Schools Conference – Asheville, NC
- 13 Western North Carolina NEED Workshop – Asheville, NC
- 27-31 NEED workshops at the National Science Teachers Association Convention – Philadelphia, PA. A NEED teacher reunion event is planned, if you are attending, contact [mspruill@need.org](mailto:mspruill@need.org).

## April

- 11-13 NEED Teacher Advisory Board Meeting – Middletown, VA
- 15 ILEED Workshop – St. Jacob, IL
- 15 Youth Awards Projects due to State Offices or NEED Headquarters
- 15 Illinois Youth Leadership Award Applications due to NEED Headquarters
- 27 Youth Awards Projects due to NEED Headquarters from state offices

## May

- 6 ILEED Youth Awards Luncheon
- 22 Kentucky NEED Youth Awards Luncheon – Frankfort, KY

## June

- 10-12 Nebraska NEED Conference – Aurora, NE
- 20-23 National Youth Awards for Energy Achievement – Hyatt Regency Crystal City, VA

## July

- 12-16 NEED National Energy Conference for Educators – Chicago, IL
- 13-18 ILEED Camp KEEP (Kids for Energy and Environmental Protection) – Cantrall, IL
- 19-23 NEED National Energy Conference for Educators – Galveston, TX
- 21-26 ILEED Camp KEEP (Kids for Energy and Environmental Protection) – Algonquin, IL
- 21-25 KY Energy Conference for Educators – Western KY
- 26-30 NEED National Energy Conference for Educators – Denver, CO

# NEED NEWS

## NEED Teachers Receive National Board Certification

Congratulations to NEED Leaders Wayne Yonkelowitz (Fayetteville Middle School, WV), Linda Fonner (New Martinsville School, WV) and Teresa Griegoliet (Goodwin School, IL) who recently received National Board Certification!

## 2001 NEETF/Roper Report Card--Americans Lack Basic Energy Knowledge

In September 2001, a random survey of 1,503 adults, aged 18 and older, found that only 12 percent of Americans can pass a basic quiz on energy knowledge. Just one in eight Americans can correctly answer such questions as how most of our electricity is generated, whether gas mileage is rising or falling, and what the fastest growing sector of the economy is with regard to energy consumption. Seventy-five percent of those taking the quiz, nevertheless, rated themselves as having "a lot" or "a fair amount" of knowledge about energy.

The survey was conducted by the National Environmental Education & Training Foundation (NEETF) and Roper ASW. The report is available at [www.neetf.org](http://www.neetf.org).

# NEED NEWS

## **No Child Left Behind**

In 2002, President Bush signed the No Child Left Behind Act into law. This federal education reform law will affect virtually every aspect of K–12 education. By the 2007–2008 school year, all states must administer science assessments to students in grades 3–5, 6–9, and 10–12. Annual testing for students in grades 3–8 in math and reading must begin in 2005. New provisions in NCLB will influence professional development provided to teachers. NCLB requires that by the end of 2005–2006, all states must ensure that every core subject classroom teacher is ‘highly qualified’. To meet this definition, a teacher must be certified or licensed, hold a bachelor’s degree, and have demonstrated competencies in his/her teaching area. Approximately \$2.8 billion in Title II grants to states and districts will be available for professional development and teacher quality programs. Consider adding a NEED program to your professional development plan!

## **Kentucky Schools Have Opportunity to ‘Go Solar’!**

The Kentucky NEED Project, in partnership with the Kentucky Division of Energy, American Electric Power, and the Foundation for Environmental Education, will facilitate the installation of solar panels in ten Kentucky schools. Kentucky NEED will provide the solar curriculum and training for teachers. Applications and additional information are available by contacting Karen Reagor at [kreagor@need.org](mailto:kreagor@need.org).

## **PRSEA National High School Solar Design Contest**

The Potomac Region Solar Energy Association (PRSEA) announces the 9th Annual National High School Solar Design Contest. Through the contest, high school students have the opportunity to win cash prizes by designing innovative and practical solar powered devices that meet current market needs. Past winners include a composter, a can and barrel crusher, a swinging hammock, and a desalinization unit. Last year’s grand prize design for a solar pond aerator was entered by Mary Babcock of West Springfield High School, VA. This year’s contest deadline is April 30, 2003, after which entries will be judged and winning designs will be put on display at the Capital Children’s Museum in Washington, DC. For details of the contest, you can download the contest brochure from the PRSEA website at [www.prsea.org](http://www.prsea.org) or contact the contest administrator at [ewmonroedc@hotmail.com](mailto:ewmonroedc@hotmail.com).

## **Can You Find What You’re Looking For?**

In a continuation of the NEED partnership with the Energy Information Administration, we are asking NEED teachers and students to volunteer to participate in the EIA Kid’s Page Usability Study. This study will help EIA see what makes the Kid’s Page successful and where improvements can be made to serve teachers and students better! There will be two parts to the study. The first component in late spring will involve 15–20 students and 15 teachers/educators. It will be held in Washington, DC, or at the computer lab of your school, with three–four students at a time answering a series of questions while using the EIA Kid’s Page website. All grade levels are needed. The second component will be a study of students and teachers attending the NEED Youth Awards Ceremonies in June in Washington, DC. The study will be conducted on Friday, June 20<sup>th</sup>; so if you and your students are planning to attend the conference and are willing to give us an hour on Friday, please let us know. To volunteer for either study, please email Mary Spruill at [mspruill@need.org](mailto:mspruill@need.org).

## **New Mexico**

Teachers from Roswell and Artesia, New Mexico, came together for some energy fun in January. The workshop—sponsored by the Independent Petroleum Association of New Mexico—provided teachers with the training and materials needed to implement NEED activities in their schools. Several educators from southeastern New Mexico will receive sponsorship to attend a NEED Energy Conference for Educators in July 2003.

## **Rhode Island**

The RI NEED Project is going strong, with four workshops in December and three in January. The workshops—facilitated by Lead Teacher Joanne Spaziano and students at Park View Middle School and Cranston High School East—train hundreds of students each year. The students have expanded their programs to include multilingual workshops. The project is funded by the Rhode Island State Energy Office and Narragansett Electric–National Grid.

## **Louisiana**

Fifty Plaquemines Parish teachers came out on a Louisiana Saturday morning to learn more about energy and how to incorporate NEED programs into their classroom curriculum. Thanks to the leadership of NEED Lead Teacher Susan Leger, the workshop filled to capacity! The Plaquemines Parish program is supported by BP.

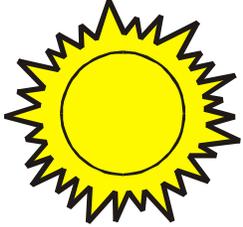
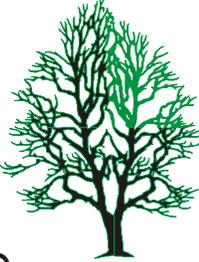
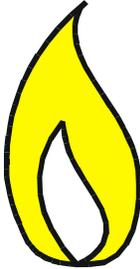
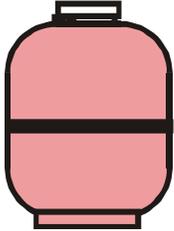
## **Virginia**

Thanks to the support of American Electric Power, Roanoke County teachers were treated to a day of NEED activities and training. Roanoke County Public Schools Energy Manager Butch Kelly and Science Coordinator Donna Connor brought 20 eighth–grade teachers together to help them implement NEED programs in their classrooms. This program will help fulfill science education requirements for the school system and help students reduce energy use in their classrooms. The workshop was sponsored in part by Johnson Controls, Inc, and Roanoke Gas Company.

# PRIMARY ACTIVITY: Dichotomous Key of the Energy Sources

**Directions:** Use as a reinforcement activity for characteristics of the major energy sources. Make copies of the key below for students. Distribute them to the students and explain how to fill in each square, using hydropower as an example.

1a Renewable..... go to 2	6a Fossil fuel..... go to 7
1b Nonrenewable..... go to 6	6b Energy-rich mineral..... Uranium
2a Can be burned..... Biomass	7a A gas..... go to 8
2b Is not burned..... go to 3	7b A solid or liquid..... go to 9
3a Energy from space..... Solar	8a Moved by pipeline..... Natural Gas
3b Energy in/on the earth..... go to 4	8b Shipped in tanks..... Propane
4a Inside the earth..... Geothermal	9a Mined from the earth..... Coal
4b On the earth's surface..... go to 5	9b Pumped from the earth..... Petroleum
5a Moving water..... Hydropower	
5b Moving air..... Wind	

<p>1a - 2b - 3b - 4b - 5a</p>  <p>A</p>	 <p>B</p>	 <p>C</p>	 <p>D</p>	 <p>E</p>
 <p>F</p>	 <p>G</p>	 <p>H</p>	 <p>I</p>	 <p>J</p>

Developed by Doris Tomas, NEED Lead Teacher, Jackson Elementary School, Rosenberg, TX

# ELEMENTARY ARTICLE: Will Your First Car Be An EV?

Today, most people in the United States drive cars that run on gasoline. By the time you're ready to buy your first car, you will have lots of choices. You will be able to choose from cars that run on electricity, natural gas, ethanol, propane, or a mixture of fuels.

## Electric Vehicles (EVs)

In 1891, William Morrison of Des Moines, Iowa, built the first electric car. By the turn of the century, there were twice as many electric vehicles (EVs) as gasoline-powered cars. Today, there are about 10,500 EVs in use in the United States, mostly in the West and South. Researchers are still working on the same problem that plagued those early electric vehicles—an efficient battery.

## The Battery is the Challenge

Electric vehicles must have batteries that can be recharged over and over again. Since most batteries can't store large amounts of electricity, an EV must carry as many batteries as possible. In some EVs, the batteries make up almost half the weight of the car. The batteries must be replaced every 20,000 to 30,000 miles, which is expensive.

The batteries limit the range of an EV—how far it can go on a charge. The more batteries an EV has, the more range it has, to a point. Too many batteries can weigh down a vehicle, causing it to use more energy. The typical EV can only travel 50 to 130 miles between charges. EVs can only go this far with perfect driving conditions. Weather, hills, and air conditioning can reduce the range. Even listening to the radio or turning on the lights can reduce the range.

Electric vehicles are not for people who must drive long distances. They are best as neighborhood or low speed vehicles for drivers going short distances at speeds of 30 mph or less.

Research is being done to develop advanced batteries that will increase the range. Some of these are like the batteries used in portable computers. These advanced batteries could double the range of EVs, and last longer before they have to be replaced.

## Environmental Impacts

Electric vehicles produce no tailpipe emissions, but making the electricity to charge them can. EVs are really coal, nuclear, hydropower, oil, and natural gas cars, because these fuels produce most of the electricity in the U.S. Coal alone generates more than half of our electricity. When fossil fuels are burned, pollutants are produced like those from the tailpipe of a gasoline-powered car. Power plant pollution,

however, is easier to control than tailpipe pollution. Emissions from power plants are controlled and monitored carefully. And power plants are usually located outside major cities.

## Maintenance

The low maintenance of electric vehicles is appealing to many people. EVs need no tune-ups, oil changes, water pumps, radiators, injectors, or tailpipes. And no more trips to the service station. EVs can be refueled at home at night when electric rates are low, making the fuel cost about the same as gasoline. There are also 602 refueling stations, mostly in California and Arkansas.



*This is the second elementary article in a series on future transportation options - see the Nov/Dec issue for the first article.*

# INTERMEDIATE ACTIVITY: Energy Source Web Quest

## Introduction

There are ten major energy sources used in the United States today. Energy is a part of every aspect of our lives. It is important to learn about energy and its impact on our society.

## Objective

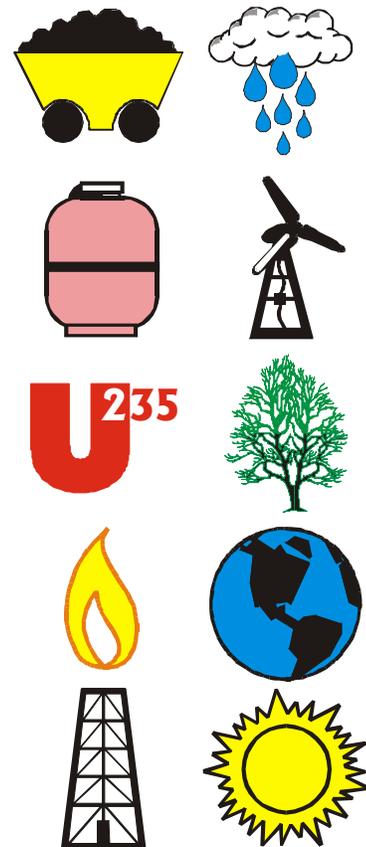
Students will learn about energy sources using web-based resources and create Powerpoint presentations to teach other students.

## Procedure

1. Students in groups of two will be assigned an energy source.
2. Student groups will use the computer lab to research information about their energy source, using at least three of the web resources listed.
3. Student groups will use the computer lab to create Powerpoint presentations on their energy source. The presentations will include:
  - Title slide
  - Eight-to-ten slides that provide the following information about the energy source:
    - description of the energy source, including renewable or nonrenewable
    - history of the energy source
    - where the energy source is found and how it is recovered
    - how energy is stored in the source and how the energy is released
    - how the energy source is used today
    - advantages and disadvantages of the energy source
    - economic impacts of the energy source
    - environmental impacts of the energy source
    - future of the energy source
    - other interesting facts about the energy source
  - Resource listing slide
4. Student groups will present their projects to the class.

## Resources

[www.need.org/infobooks.htm](http://www.need.org/infobooks.htm): NEED's energy sources fact sheets  
[www.eia.doe.gov/kids](http://www.eia.doe.gov/kids): Energy Information Administration's Kid's Page  
[www.energy.gov/kidz/kidzone.html](http://www.energy.gov/kidz/kidzone.html): Department of Energy's Kids Zone  
[www.awea.org](http://www.awea.org): American Wind Energy Association  
[www.acf-coal.org](http://www.acf-coal.org): American Coal Foundation  
[www.nei.org](http://www.nei.org): Nuclear Energy Institute  
[www.hydro.org](http://www.hydro.org): National Hydropower Association  
[www.ases.org](http://www.ases.org): American Solar Energy Society  
[www.propanecouncil.org](http://www.propanecouncil.org): Propane Education and Research Council  
[www.biomass.org](http://www.biomass.org): American Bioenergy Association  
[www.geotherm.org](http://www.geotherm.org): Geothermal Energy Association  
[www.api.org](http://www.api.org): American Petroleum Institute  
[www.ngsa.org](http://www.ngsa.org): Natural Gas Supply Association



## Evaluation

Students will evaluate each group using a 1-to-5 rubric which includes knowledge of the energy source, content of the presentation, level of participation in the research and presentation, and design and creativity of the presentation.

## Conclusion

Class discussion emphasizing the fact that every energy source has advantages and disadvantages and that it is important to use many energy sources to provide the energy needed in the U.S.

## Extension

Use this format to study emerging energy technologies such as hydrogen fuel cells, fusion, wave energy, and more.

*This activity was developed by Doris Tomas, NEED Lead Teacher, Jackson Elementary School, Rosenberg, TX.*

# SECONDARY ARTICLE: GAMMA RAY BURSTS

Gamma rays are high-energy, short wavelength radiation. About once a day, the sky lights up with a short spectacular flash, or burst, of gamma rays. The source of the burst then disappears altogether. No one can predict when the next burst will occur or from what direction in the sky it will come. At present, scientists aren't even sure what causes these flashes or how far away they are. They do know that there is an enormous amount of energy in the bursts.

The two most discussed theories about the kinds of objects responsible for gamma-ray bursts are:

- ◆ Neutron stars in a big halo that surrounds the outside of our Galaxy.
- ◆ Some very, very powerful object that is not necessarily in our Galaxy in great abundance, but which can be found in all galaxies in the Universe.

For a long time, astronomers thought that the sources of GRBs were in our Milky Way Galaxy, which would help explain the enormous amount of energy detected. Scientists, therefore, expected the distribution of GRB locations to be concentrated along the galactic plane. The galactic plane is where most of the stars are located in our Galaxy, and it was believed that a GRB had to be related to some stage of the life of a star.

However, this is not what scientists see. Bursts occur randomly all over the sky. This makes it very hard for scientists to determine what is causing the GRBs and where to look for the next burst.

One way to discover the kind of object that is responsible for a GRB is to find what is called a 'counterpart' to the burst. The 'counterpart' is an object that is connected to the GRB-emitting object, for example an object in a binary system. It is called a 'counterpart' because it is an object that can be used to study the GRB-emitting object in an indirect way. If scientists can see the counterpart in another part of the electromagnetic spectrum, this would allow them to bring a whole range of science tools to bear on what is causing the GRB, such as spectra, photometry, distance estimates, and comparisons with other objects.

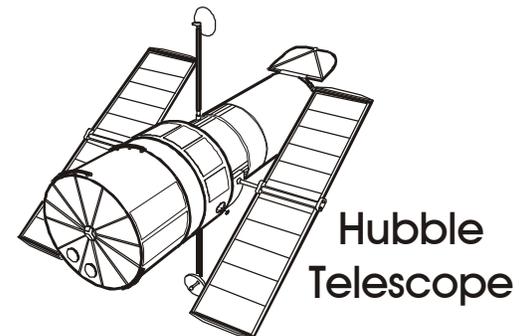
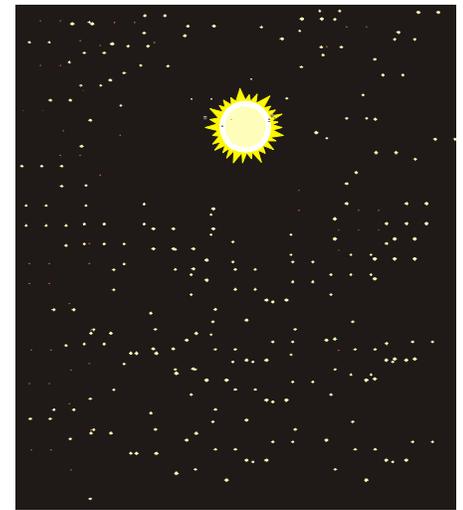
*A gamma ray burst on January 23, 1999, had the power of nearly ten million billion suns, and the light grew so bright that anyone gazing at the night sky could have seen it using only a pair of binoculars. The chances were slim, however, that someone would be looking at that exact point in the sky at 4:47 a.m. EST. But thanks to the use of two satellites, a unique ground-based telescope, and the Internet, scientists around the world were able to pinpoint the location of the burst and to monitor it from start to finish. Scientists, using gamma-ray telescopes, detect only a few hundred gamma-ray bursts a year.*

Today, two optical counterparts of recent gamma-ray bursts are being closely observed by astronomers. The preliminary results of these observations seem to show that the bursts originate billions of light-years from Earth.

Analysis of a February 2002 burst reveals that the burst object is associated with a faint, fuzzy patch of light dwarfed by the brighter emission of the GRB source. This faint emission is thought by many scientists to be distant galaxy, within which some cataclysmic event led to the GRB. The Hubble telescope allowed astronomers to determine that the source of the burst is not at the center of the galaxy, but is offset, most likely in the disk population of normal stars.

This finding seems to rule out the possibility that gamma ray bursts are powered by massive black holes at the center of galaxies and, instead, suggests that the products of typical stellar evolution, such as colliding neutron stars, are the most likely producers. Our Milky Way could produce a bursting object every few million years, an explosion that, for a few seconds, could out-shine the entire galaxy.

*For more information on GRBs, go to [www.batse.msfc.nasa.gov](http://www.batse.msfc.nasa.gov).*



# Short Circuits

## Solar-Powered Convenience Store

Illinois' first downstate solar-powered convenience store officially opened in December 2002. Mac's Convenience Store is generating a lot of enthusiasm for solar power as a clean renewable source of energy. "Generating electricity from sunlight is becoming an important source of power for many Illinois consumers," said Joseph Hannon, acting Director of the Illinois Department of Commerce and Community Affairs (IL-DCCA). "Illinois is committed to solar power as part of our state energy policy. We look forward to developing additional demonstration projects that incorporate energy efficient designs and renewable energy technologies in new construction and building renovations."

In July, IL-DCCA awarded a \$60,741 renewable energy grant to construct the solar-powered convenience store. Mac's, in partnership with BP and DCCA, used the funds to purchase and install 280 photovoltaic panels as part of a \$1 million renovation of the former Amoco gasoline station. The newly renovated facility features an array of solar modules integrated into a translucent pump island canopy. The solar modules will generate 10.1 kilowatts of electricity—enough power to meet about 20 percent of the station's overall energy needs. The solar modules will lower the station's operating costs by reducing the amount of electricity the store must purchase. The solar canopy is a prominent feature at BP Connect, the company's new retail concept. Photovoltaic modules are integrated into the canopy panels using a "thin film" technology developed by BP Solar to harness power from the sun while permitting light to pass through. The result is a clean, bright look across the fuel dispensing area.

## Northern KY Firm Puts Faith in Biodiesel

Using old oil collected from the deep fryers of restaurants may not sound like a great way to power a truck or bus, but biodiesel is quickly becoming a growth industry. Ask Griffin Industries of Cold Spring, KY, which began making the fuel additive out of recycled fry oil and unspoiled soybean oil four years ago and reports that as of 2001, its small operation is profitable.

Biodiesel is the fastest-growing alternative fuel in the country, according to the National Biodiesel Board, because using biodiesel can extend engine life, improve fuel economy, and reduce air pollution. The mixture of regular diesel and biodiesel releases less carbon monoxide and fewer hydrocarbons and particulate matter than petroleum-based diesel, according to the U.S. Environmental Protection Agency.

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