



*Eva Nogales is having a banner millennium.*

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## Research Highlights . . .

### Alternative glazing shines in vehicle test

Researchers at [DOE's National Renewable Energy Laboratory](#) recently completed a side-by-side vehicle test in Phoenix, Ariz., designed to determine the benefits of using a new alternative window glazing versus a standard glazing. Test results indicate the new [solar reflective glass](#) resulted in reduced passenger compartment temperatures and heat gain. Lower interior temperatures could allow automobile manufacturers to reduce the size of air conditioners in vehicles or let passengers use their air conditioners for a shorter time, resulting in improved fuel economy and reduced tailpipe emissions.

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### Cutting out food waste

Researchers at [DOE's Pacific Northwest National Laboratory](#) and their collaborators at Lamb-Weston Technical Research Center in Richland, Wash., have developed a system that reduces losses on food production lines by immediately identifying cutting blade failures. Broken knives can generate truckloads of product that don't meet quality specifications. Processing plants must re-sort the product and ship the waste for use as animal feed. Inspectors can take upward of an hour to catch blade failures but the Knife Failure Detector takes less than a second to spot part failure and trigger redirection of the product flow. The detector system combines wireless power and data transmission with acoustic-based detection methods.

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### Flame measurement optimizes combustor operation

In modern, low-emission gas turbines, clean operation requires precise control of local fuel-air ratio produced by multiple fuel injectors. The Gas Energy Systems Dynamics Focus Area at [DOE's National Energy Technology Laboratory](#) is investigating methods to measure and control natural gas flames to maintain very low pollutant emissions. As an alternative to using optical probes, GESD has completed lab tests on a 30kw combustor that suggest a representative measurement of the desired fuel-air ratio can be obtained from electrical properties of practical flames. These measurements are made using simple electrodes that can potentially be embedded in the combustor wall, avoiding the complication of optical access.

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### Super-efficient water heater boasts quick payback

Water heating consumes about 17 percent of the energy for a typical household. The [Building Technology Center](#) at [DOE's Oak Ridge National Laboratory](#) is assisting in developing a [heat pump water heater](#) as a replacement for a conventional water heater. It can provide a two-year payback because of its greater efficiency. The heat pump water heater has an energy factor of 2.47 as compared with 0.95 for the most efficient conventional electric units. If installed where there is a floor drain, it will provide space cooling and dehumidification as well as hot water. If broadly adopted, use of this water heater could save almost 1 percent of the country's energy consumption.

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## NREL and California Air Agency to Test Clean Diesel Fuels

**D**OE's National Renewable Energy Laboratory will test Fischer-Tropsch synthetic diesel fuel for California's South Coast Air Quality Management District (SCAQMD) to determine if using the fuel can help reduce air pollution.

Fischer-Tropsch fuels can be produced from natural gas, biomass or coal. They are void of sulfur and aromatic chemical compounds, and therefore can reduce exhaust emissions from diesel vehicles. Fischer-Tropsch fuels, named after the German coal researchers Franz Fischer and Hans Tropsch, who discovered the process for synthesizing hydrocarbons, are used in South Africa today and have been blended with crude oil-derived fuels in California to meet the state's diesel fuel quality standards. Synthetic diesel fuels have not been widely used in the United States.



*Emissions testing of a truck fueled with Fischer-Tropsch diesel fuel*

In 1998 NREL and its project partners from DOE and West Virginia University (WVU) conducted what is believed to be the first controlled tests of Fischer-Tropsch synthetic fuels in heavy vehicles. The tests showed that Fischer-Tropsch fuels can be substituted in unmodified trucks and buses without any detectable loss in

performance. The Fischer-Tropsch fueled vehicles emitted about 12 percent less nitrogen oxide and 24 percent less particulate matter than vehicles fueled with conventional diesel.

NREL's project with the SCAQMD will test Fischer-Tropsch fuels in a small vehicle fleet operating in southern California. The vehicles will be retrofitted with catalyzed exhaust filters to virtually eliminate diesel smoke, odor and particulate matter emissions. Project partners include DOE, NREL, SCAQMD, WVU and the National Energy Technology Laboratory.

The SCAQMD is concerned about the potential health risk associated with diesel exhausts. Fuels with low sulfur and low aromatic content may enable the use of catalyzed exhaust filters to reduce diesel emissions.

"Based on previous research, we expect the fleet to have very low exhaust emissions while maintaining diesel-like fuel efficiency," said NREL principal investigator Keith Vertin. "We will be evaluating an experimental Fischer-Tropsch fuel for 12 months to determine if there are any engine reliability problems or fleet operating issues that need to be resolved."

DOE currently is evaluating petitions from three companies to register their Fischer-Tropsch products as alternative fuels under the Energy Policy Act of 1992 (EPACT).

"We are working with industry to develop paths for introducing Fischer-Tropsch synthetic fuels into the marketplace as well as trying to reduce vehicle emissions," Vertin said.

*Submitted by DOE's National Renewable Energy Laboratory*

## FOR EVA NOGALES, IT'S BEEN A BANNER MILLENNIUM

So far, this has been a banner millennium for Eva Nogales, a biophysicist with DOE's Lawrence Berkeley National Laboratory (Berkeley Lab). In May, she was one of the 48 winners of a national competition to be appointed as an



*Eva Nogales*

investigator for the prestigious Howard Hughes Medical Institute (HHMI). In October, she won the Burton Medal, an annual award presented by the Microscopy Society of America to honor distinguished contributions to the field of microscopy and microanalysis by a scientist under the age of 40.

In between these two events, on August 18, she gave birth to her first child, a son she and her husband, Howard Padmore, a scientist at Berkeley Lab's Advanced Light Source, named Carlos Daniel Padmore.

Nogales' rapid rise to scientific prominence sprang from the major role she played in producing the first three-dimensional, atomic-scale model of tubulin, a highly flexible protein that enables a living cell to carry out such vital activities as mitosis (division) and the regulation of materials passing into the cell. The model created by Nogales and her colleagues revealed valuable new information about tubulin's role in potential cancer treatments.

Now with a lab of her own, Nogales most recently made headlines for her part in using a unique combination of electron microscopy and single-particle image analysis to produce the first 3-D images of the protein complex that initiates DNA transcription.

Born in Madrid, Spain, Evangelina Nogales de la Morena is a true international scholar, having earned her undergraduate degree in physics from the Universidad Autonoma de Madrid, and her Ph.D. from the University of Keele in England. She joined Berkeley Lab in 1993 as a post-doctoral fellow and within five years went on to become a staff scientist with the Life Sciences Division, as well as an assistant professor with the Molecular and Cell Biology Department of the University of California at Berkeley.

*Submitted by DOE's Lawrence Berkeley National Laboratory*