



ANL's Arun Wagh

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Research Highlights . . .

New Truck Stop Electrification Station Maps Help Truckers Reduce Idling

Researchers at DOE's **National Renewable Energy Laboratory** have developed a new Internet-based mapping program to help truckers find truck stops with idle reduction facilities—on-site systems that can substantially cut fuel use while reducing air emissions. Truck stop electrification allows truckers to “plug in” their long-haul tractor-trailers so they can operate the heater, air-conditioner and run electrical appliances when they are resting. Estimates show idle reduction technologies could reduce diesel fuel use by about 800 million gallons annually, with a potential savings to the trucking industry of \$2 billion each year. The Truck Stop Electrification Station Locator is available online at www.eere.energy.

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Flame at pressure measured

Using laser techniques, the combustion group at DOE's **National Energy Technology Laboratory** has measured the flame structure of natural gas and hydrogen-augmented fuels and collected high quality images at pressures up to 8 atmospheres. Collaborating with Sandia National Laboratories, NETL made the first measurements at pressure, and since then NETL has made significant improvements in the measurement signal strength and has been able to extend the range of measurements. This represents some of the most complete data available on turbine-scale hydrogen flames at pressure. The data sets with hydrogen also will enable a better understanding of fuel variability effects, important for development of turbines for FutureGen.

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Needed: Nuclear physicists

At a time when more nuclear physicists are needed to develop technologies for homeland security and to meet expected growth in the nuclear power industry, the nation's universities are producing fewer of these researchers. That's part of the message that Ed Hartouni, a physicist at **Lawrence Livermore National Laboratory**, presented April 22 during the four-day national meeting of the American Physical Society (APS) at the Hyatt Regency Hotel in Dallas. The number of nuclear physicists produced by U.S. universities has been **declining** by 3 percent per year for the past decade, dropping to 66 nuclear physicists in 2003, said Hartouni, the leader of the Laboratory's nuclear and particle physics division. (The average number of nuclear physicists produced annually during the past decade has been 84).

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Acclimation a plant factor in climate change

Estimates of increased plant respiration in response to higher global temperatures may be somewhat overstated as they have not taken into account plants' ability to adjust to changing conditions, according to researchers from DOE's **Oak Ridge National Laboratory**. In a Perspectives paper published April 28 by Science, a team led ORNL findings suggesting that about 9 percent more carbon will be stored in plants and soil with the acclimation of plants included in the model. While this amount is relatively small compared to different climate-carbon simulations performed over the years, the authors note that this acclimation phenomenon should not be ignored. ORNL's study looked at the period from 1930 to 2100, with and without acclimation of leaf respiration.

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National program advances knowledge of natural attenuation

Natural attenuation based remedies for chlorinated solvents are simple in concept but can be complicated in real-world applications. Dr. Brian Looney of the [Savannah River National Laboratory](#) is leading a team of nationally recognized scientists and engineers developing concepts and tools to support the use of attenuation based remedies at sites with wide ranging conditions where a variety of attenuation processes act to stabilize the plume, under a project funded by DOE Office of Environmental Management and managed by EM's Claire Sink. A challenge faced by all site owners is determining when and how to transition from either active source removal or plume treatments to Monitored Natural Attenuation. Two of the key topics under development in this project support making the transition decision. The first involves employing a mass balance to evaluate whether a plume is stable or shrinking; project participants are exploring how to do those calculations and gather the appropriate data. The second concept, Enhanced Attenuation, enables a site owner to transition from an active source or plume technology to a designed technology that, once implemented, results in sustainable attenuation mechanisms and meeting compliance goals.

An integral component of the project is a set of 14 research studies managed by Karen Vangelas of SRNL that further our scientific understanding and measuring of attenuation processes. Several of the studies have taken advantage of knowledge gained in the basic science programs such as Environmental Management Science and Natural and Accelerated Bioremediation Research Programs (now DOE-ERSP) and the Strategic Environmental Research and Development Program (DOD-SERDP). These applied science studies support the transition of basic science to practical real-world usage. Studies are described in the project's newsletter, the [Natural Attenuation Monitor](#).

A unique feature of this project has been the collaboration with the Interstate Technology and Regulatory Council (ITRC). DOE and the ITRC are jointly developing the concept of Enhanced Attenuation and the science and technologies that support its implementation and monitoring. This collaboration will lead to the ITRC incorporating the most promising technologies and concepts into a technical-regulatory guidance document and subsequent training programs, thus facilitating acceptance by regulators and a level of comfort by site owners to include the new technologies in their remediation plans.

Submitted by DOE's Savannah River National Laboratory

ANL's WAUGH SEEKS CONCRETE ANSWERS TO HOUSING SHORTAGE

The United Nations estimates there are almost a billion poor people in the world, 750 million of whom live in urban areas without adequate shelter and basic services. Argonne scientist Arun Wagh has developed a promising new technology that he hopes will lead to affordable housing for some of the these millions living in poverty.



Argonne researcher Arun Wagh demonstrates Grancrete.

Collaborating with the Virginia firm Casa Grande LLC, Wagh developed a tough new ceramic material that is almost twice as strong as concrete. The ceramic is called Grancrete, which, when sprayed onto a rudimentary frame, dries to form a lightweight but durable surface. The resulting house is a major upgrade to the fragile structures in which millions of the world's poorest currently live. Grancrete is based on an Argonne-developed material called Ceramicrete, which was developed to encase nuclear waste.

Experiments have shown that Grancrete is stronger than concrete, is fire resistant and can withstand both tropical and sub-freezing temperatures. Currently, Grancrete is sprayed onto Styrofoam walls, to which it adheres and dries. The Styrofoam remains in place as an effective insulator, making the home both strong and comfortable.

Wagh's goal is to see Grancrete used in his native India and throughout the world to produce housing for the poor. Born in Karnataka, Wagh grew up in a neighborhood where even to this day the homes have walls and ceilings made from knitted mats of palm leaves, and the floors are made of dried cow dung.

Grancrete won an R&D 100 award in 2004, and the original technology Ceramicrete received an R&D 100 in 1996. These awards are given annually by R&D magazine to recognize the 100 most technologically significant inventions. Wagh's latest honor will come this spring when he is named Inventor of the Year by the Intellectual Property Law Association of Chicago.

Submitted by DOE's Argonne National Laboratory