ANL's Ron Kulak

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DOE Pulse

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Research Highlights . . .

Insight into radiation damage to DNA

A new technique for studying repair of radiation-damaged DNA indicates that complexity of damage configuration is more important than the number of lesions in determining repairability. The technique, developed at DOE's Brookhaven Lab, helps reveal why high-energy charged particles such as those found in outer space or used in cancer radiotherapy are potentially more harmful than x-ray or gamma radiation. The findings could help clarify risks faced by astronauts, cancer patients, and radiation workers. The technique, which uses fluorescent tags rather than radioactivity to monitor DNA repair, earned a "Best in Class" pollution prevention award from DOE's Office of Science.

[Karen McNulty Walsh, 631/344-8350, kmcnulty@bnl.gov]

Plug-in hybrids: Recharge overnight

A growing number of plug-in hybrid electric cars and trucks could require major new power generation resources or none at all—depending on when people recharge their automobiles. A recent study by DOE's Oak Ridge National Laboratory study examined how an expected increase in ownership of hybrid electric cars and trucks will affect the power grid depending on what time of day or night the vehicles are charged. Some assessments of the impact of electric vehicles assume owners will charge them only at night, while onsumers may be more included to plug in when convenient . Utilities will need to create incentives to encourage people to recharge when system loads are low. Technologies such as "smart" chargers can optimize charging for both the owner and the utility.

[Larisa Brass, 865/574-4163, brasslm@ornl.gov]

Imager spots and samples tiny tumors

A new medical imager for detecting and guiding the biopsy of suspicious breast cancer lesions is capable of spotting tumors that are half the size of the smallest detected by standard imaging systems, according to a new study. The positron emission mammography/tomography (PEM/PET) breast imaging and biopsy system was designed and constructed by scientists at DOE's Jefferson Lab, West Virginia University and the University of Maryland School of Medicine. The PEM/PET system takes about the same amount of time to image a suspicious tumor and complete a biopsy as it takes for a traditional biopsy.

[Kandice Carter, 757/269-7263, kcarter@jlab.org]

3-D photonic crystals make novel add-drop filters

Researchers at DOE¹s Ames Laboratory have come up with a potentially perfect way to sort and distribute the massive amounts of data that travel daily over optical fibers to people throughout the world. The new technology, a three-dimensional photonic crystal add-drop filter, promises greatly enhanced transmission of multiple wavelength channels (wavelengths of light) traveling along the same optical fiber. The innovative filter is a significant achievement in the effort to develop all-optical transport networks that would eliminate electrical components from optical transmission links and guarantee virtually flawless data reception to end users of the Internet and other fiber-based telecommunications systems.

[Saren Johnston, 515/294-3474, sarenj@ameslab.gov]

DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Collaboration advances offshore wind energy potential

Preliminary research has shown that the Eastern seaboard has the largest untapped supply of wind energy in the United States. Development of this resource will require detailed assessment of the wind characteristics, an understanding of the public concerns associated with wind power, and educational outreach.

A project by DOE's Savannah River National Laboratory, utility provider Santee Cooper, Clemson University's S.C. Institute for Energy Studies, Coastal Carolina University and others will provide critical data and experience necessary to develop wind resources available off the coast of South Carolina. The ultimate goal is the deployment of offshore wind energy technology to diversify South Carolina's energy portfolio and a new maritime industry serving the Eastern seaboard that can significantly increase the region's energy independence.

The team is testing, developing and evaluating new technology for assessing wind power off-shore, then will use that technology to assess the coastal and offshore wind potential of coastal South Carolina counties. Initial testing of SecondWind's Triton Sound Detection and Ranging (SODAR) station will be performed at SRNL; then the SODAR will be moved to a marsh on the South Carolina coast to determine its suitability for a marine environment. The final phase of SODAR testing will be conducted offshore on a U.S. Coast Guard platform.

The offshore testing will study the compatibility of the Triton SODAR in ocean conditions, develop algorithms to correct for movement of the unit caused by ocean waves, and study the ocean's acoustic environment that may impact the SODAR's sensors. Data will be collected from the platform for one year to better understand the wind characteristics along the transitional area from offshore to the coast.

Results of this research will be a new methodology for assessing offshore winds using a mobile platform, as well as a better understanding of the economic viability of an offshore wind farm in the region.

Costs in recent years have come down significantly, making wind power the most cost effective renewable energy source; it produces no greenhouse gases, harmful emissions or hazardous waste. It has been estimated that South Carolina alone could produce up to 3.5 GW of power from its coastal and offshore wind resources using existing technology. Capturing only 2.4% of this potential (1000 MW) would reduce greenhouse gas emissions by 1.2 to 2.5 M tons per year and up to 16K tons of SO2 emissions.

Submitted by DOE's Savannah River National Laboratory

Researchers TRACC Chicago traffic

TRACC engineer Ron Kulak stands next to a display of one of TRACC's bridge models.

At 8:24 a.m. on a bright September morning, a man pulls into the exit lane and turns off the Kennedy Expressway on his way to work on Roosevelt Street in downtown Chicago. One minute and 17 seconds later, his wife pulls into a parking lot in Des Plaines en route to a dentist appointment. Twelve minutes and 32 seconds later, their son's school bus drops him off for the first day of fifth grade in Evanston.

It's just another Tuesday in a model created by Argonne researchers at the recently-opened Transportation Research and Analysis Computer Center (TRACC). Led by engineer Dave Weber, the team at TRACC is able to simulate the moment-by-moment movement of millions of people in the entire Chicago metropolitan area.

This type of modeling, known in the transportation industry as "microsimulation," offers a number of advantages over older recreations of the transportation grid that only looked at road capacities and typical loads. Microsimulation requires the availability of tens of thousands of processor-hours, which are provided by TRACC's new Linux-based supercomputer. This enables the engineers to run simulations that used to take nearly a day in a matter of minutes, said TRACC engineer Ron Kulak.

The new supercomputer, which complements Argonne's newly-installed IBM Blue Gene/P and the lab's Nanoscience Computing Facility, also allows Weber and the other researchers at TRACC to undertake comprehensive and detailed modeling of human tissues during car accidents and bridge supports under heavy stresses such as flood or high winds. "In the earlier days of crashworthiness testing, engineers only considered the damage to the vehicle," Kulak said. "But eventually they realized that what was important wasn't the vehicle, it was the occupants, like you and me."

Submitted by DOE's Argonne National Laboratory