LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Jan. 2-6, 2012

POPSCI THE FUTURE NOW READ ALL ABOUT IT

Left, LLNL supercomputers. Right, NIF target chamber.

This year is expected to be a year of leaps and bounds. And the Laboratory is on the cusp of many of those expected leaps.

Popular Science recently named a dozen stories to expect in 2012 and the Laboratory garnered two of those spots.

By May, IBM will finish building a computer that churns through 20 petaflops, or 20 quadrillion calculations a second, double the current record, and this machine, named Sequoia, will be housed at the Laboratory.

And in the world of energy, LLNL's National Ignition Facility will attempt to produce a net energy gain from a nuclear fusion reaction by using 192 lasers to crush a hydrogen-filled target. Experiments begin this year.

To read more, go to *Popular Science* on supercomputing and NIF.

SCIENTIFIC AMERICAN RAMPING UP

Vestas V47 machines at the Tejona Wind Farm in Costa Rica.

Laboratory scientists are ramping up to predict the unpredictability of wind energy, which shifts drastically over the course of years, days or even hours and minutes.

These changes make scheduling power much more difficult for utilities that rely on wind turbines to serve an increasing percentage of their power demands.

So scientists are stepping in with new measurements and models that may help them manage their power more effectively. "Wind energy often has ramp events where energy increases or decreases by a large amount or in a short time. If there is an overload, there is excess energy on the grid," explained Chandrika Kamath, a Laboratory scientist.

The extra electricity, which can increase by as much as a gigawatt -- or the output of a large nuclear power plant -- in under an hour, must be quickly sold to other utilities or in many cases it is wasted. "If the ramp is a downward ramp, that is, the energy goes down, then you have to find that extra energy to keep the load balanced," she added. In the electricity industry, an "unbalanced load" can mean blackouts and brownouts.

To read more, go to *Scientific American*.

DISCOVER MAGAZINE

OVER THE MOON

The International Space Station flew across the face of the moon over NASA's Kennedy Space Center in Florida approximately 15 minutes before the launch of space shuttle Discovery on the STS-131 mission. ***Image courtesy of NASA***

Lab researcher Lars Borg may be slightly over the moon considering his research about the age of our moon made the top 100 stories of 2011 in *Discovery Magazine*.

Borg reanalyzed a moon rock collected by Apollo 16 and found it to be 4.36 billion years old, 150 million years younger than previously believed. The result hints at new, unknown details about the moon's formative collision.

The common estimate of the moon's age is as old as 4.5 billion years old (roughly the same age as the solar system) as determined by mineralogy and chemical analysis of moon rocks gathered during the Apollo missions. However, Borg analyzed three isotopic systems, including the elements lead, samarium and neodymium found in ancient lunar rocks, and determined that the moon could be much younger than originally estimated.

The new research has implications for the age of Earth as well. The common belief is that the moon formed from a giant impact into the Earth and then solidified from an ocean of molten rock (magma).

To read more, go to *Discovery Magazine*.

The New York Times WEATHER GOES EXTREME

Drought parched earth

Though 2011 may have been one of the most extreme weather years in American history, climate studies have slowed down a bit.

For many reasons, efforts to put out prompt reports on the causes of extreme weather are essentially pining away. Chief among the difficulties that scientists face: the political environment for new climate-science initiatives has turned hostile, and with the federal budget crisis, money is tight.

This year alone, the United States faced a dozen extreme events, including wildfires in the Southwest, floods in multiple regions of the country and a deadly spring tornado season.

So scientists are left with finding an answer to why we're experiencing such weather extremes.

"We are changing the large-scale properties of the atmosphere — we know that beyond a shadow of a doubt," said Benjamin. Santer, a leading climate scientist at the Laboratory. "You can't engage in this vast planetary experiment — warming the surface, warming the atmosphere, moistening the atmosphere — and have no impact on the frequency and duration of extreme events."

To read more, go to the *New York Times*.

energybiz GEARING UP FOR THE GRID

The nations' power sector is facing unprecedented changes, ranging from high levels of intermittent loading from renewable portfolio standards to complex cyber-security threats.

New technology options, such as bulk electricity storage and plug-in electric vehicles, further complicate matters for power companies and ratepayers, according to the Lab's Carbon Program Director Julio Friedmann.

Friedmann recently wrote an article for *energybiz* that discusses how California is shaping up for the energy grid.

He says that state and federal policy changes require changes to the power system, which may ultimately increase cost and decrease service reliability. Shale gas is changing the fabric of the energy business, inverting pipeline flows and investment norms. In addition, water, wind and solar resources and heat storms will affect investments and operations as our understanding of global climate change matures.

"Nowhere are these challenges more evident than in California, where the state has adopted many environmental and energy policy goals."

To read more, go to *energybiz*.

Newsline's month-by-month highlights from 2011 will appear electronically today (Jan. 6). As in the past, listings will be in four categories: Science and technology; People; Operations; and Awards. However, in a departure from past practice, the 2011 Year-in-Review will appear only electronically; there will be no print edition.

A pdf version and an interactive flash version are available for viewing for the Lab's external community. Based on feedback received from readers, the *Newsline* staff aims to make this special edition a useful reference.

To see this year's edition, go to *Newsline*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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