

Office of the President**TO MEMBERS OF THE COMMITTEE ON OVERSIGHT OF THE DEPARTMENT OF ENERGY LABORATORIES:****DISCUSSION ITEM*****For Meeting May 14, 2014*****UPDATE ON THE DEPARTMENT OF ENERGY LABORATORIES AND PRESENTATION ON THE FUTURE OF BIOMANUFACTURING AND THE CALIFORNIA BIOECONOMY**

This discussion will review recent administrative matters and program accomplishments at the three University of California-affiliated Department of Energy (DOE) National Laboratories:

- Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab)
- Lawrence Livermore National Laboratory (LLNL)
- Los Alamos National Laboratory (LANL)

New Lawrence Livermore National Laboratory Director William Goldstein

Committee Chair Pattiz will introduce William Goldstein, who was appointed President of Lawrence Livermore National Security, LLC (LLNS) and the 12th Director of Lawrence Livermore National Laboratory (LLNL) on March 31. Mr. Goldstein is a 29-year career LLNL employee with extensive experience as a scientific leader and senior manager across the Laboratory's programs and demonstrated ability to strategically guide LLNL's unique science and technology capabilities. He is highly regarded within the DOE, the Department of Defense, the National Laboratory complex, and the scientific community. Prior to becoming Laboratory Director, Mr. Goldstein was LLNL's Deputy Director for Science and Technology. He served as an Associate Director at LLNL for 11 years, as a program leader in the Stockpile Stewardship Program, and as group leader for computational physics in the Nuclear Test Program.

New Vice President for Laboratory Management Kimberly Budil

Committee Chair Pattiz will introduce Kimberly Budil, who was recommended by President Napolitano and appointed by interim action as Vice President for Laboratory Management in the University's Office of the President and as an Executive Committee Governor on the Los Alamos National Security and LLNS Boards of Governors effective May 1. Ms. Budil fills the positions vacated by Vice President Mara who retired from the University on April 30. Ms. Budil is a highly regarded scientist and laser systems expert with 27 years of scientific research and management experience at LLNL that spans a wide range of programs, including Global Security, Weapons and Complex Integration, the National Ignition Facility, and Physical and

Life Sciences. Prior to joining the University, she was the Program Manager of the Nuclear Counterterrorism Program in the Global Security Principal Directorate at LLNL.

The Future of Biomanufacturing and the California Bioeconomy

Professor Jay Keasling, of LBNL and UC Berkeley, will describe the potential of biomanufacturing, enabled by significant advances in synthetic biology and machine learning, to solve global challenges in food, water, health, and energy; the role biomanufacturing will play in the California economy; and how Berkeley Lab's new center of excellence in biomanufacturing will make all of this possible.

Mr. Keasling is the Associate Laboratory Director for Biosciences at LBNL; the Director of the Synthetic Biology Engineering Research Center at UC Berkeley; a Professor, Department of Chemical and Biomolecular Engineering and Department of Bioengineering at UC Berkeley; and the Chief Executive Officer (CEO) of the Joint BioEnergy Institute. Mr. Keasling's research focuses on engineering microorganisms for environmentally friendly synthesis of small molecules or degradation of environmental contaminants. His laboratory has engineered bacteria and yeast to produce polymers, a precursor to the anti-malarial drug artemisinin, and advanced biofuels and soil microorganisms to accumulate uranium and to degrade nerve agents. Mr. Keasling received his B.S. in Chemistry and Biology from the University of Nebraska; his Ph.D. in Chemical Engineering from the University of Michigan; and did post-doctoral work in Biochemistry at Stanford University from 1991-92.

ADMINISTRATIVE UPDATES

Frank Klotz Confirmed as Department of Energy Undersecretary for Nuclear Security and Administrator for the National Nuclear Security Administration

The U.S. Senate confirmed Lieutenant General Frank Klotz, U.S. Air Force (Ret.) as the DOE's Undersecretary for Nuclear Security and Administrator for the National Nuclear Security Administration (NNSA) on April 8. He was sworn into office by Secretary of Energy Ernest Moniz on April 17. General Klotz is responsible for the management and operation of the NNSA, as well as policy matters across the DOE and NNSA enterprise in support of President Obama's nuclear security agenda.

Department of Energy Funding of UC Pension

The DOE has now fully paid both its fiscal year 2013 and fiscal year 2014 required contributions to the University of California Retirement Plan (UCRP) for the LANL and LLNL retained segments (total amount of \$453 million). No additional funding is owed to the University by the DOE for these two years.

Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise

At a hearing of the United States Senate Committee on Armed Services Subcommittee on Strategic Forces on April 9, the co-chairs of the twelve-member Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise (NSE) – former Lockheed Martin CEO Norman Augustine and former Strategic Command Chief Admiral Richard Mies – indicated that the current NNSA governance structure is fundamentally flawed and not working. “The current DOE-NNSA structure has not established the effective operational system that Congress intended,” Augustine said. “This needs to be fixed as a matter of priority, and these fixes will not be simple or quick, and they need to recognize the systemic nature of the problem.... Fundamental reform will be required to shape an enterprise that meets all of the nation’s needs and rebuilds the essential infrastructure that is required.”

Admiral Mies summarized five systemic disorders identified by the Panel:

1. A loss of sustained national leadership focus.
2. A flawed DOE/NNSA government model.
3. A lack of sound management principles and practices.
4. A dysfunctional relationship between the NNSA federal workforce and their management and operating partners.
5. A lack of close collaboration with selected customers (mainly the Department of Defense weapons customers).

Specific Advisory Panel recommendations were not presented during the hearing. The Advisory Panel is expected to submit its final report later this summer. To read and/or view the Senate testimony, which includes testimony from the National Security Laboratory Directors, see: <http://www.armed-services.senate.gov/hearings/14-04-09-national-nuclear-security-administration-management-of-its-national-security-laboratories-and-the-status-of-the-nuclear-security-enterprise>

Transition of UC’s Department of Energy Facility Clearance

In order to increase the efficiencies related to UC’s DOE Facility Clearance function and to address DOE’s concerns with the number of overall clearance holders within the DOE complex, the University is transitioning its DOE Facility Clearance authority to LLNL. The University is effectively transitioning the security clearance authority (as well as other classified capability) to LLNL where they have the full suite of expertise and depth to handle clearances, issuance of security credentials, related training, etc. As a result, changes will take place in the way DOE security clearances are sponsored and maintained for UC Regents and employees. A limited number of UC Regents and UC senior leadership will retain their DOE clearances because of their direct engagement in the management and oversight of the LLNL and LANL prime contracts. Clearance holders from LBNL will be transitioned to the DOE Office of Science and other sponsors. The UCOP Laboratory Management Office is actively working on this transition, and UC DOE clearance holders will receive notification shortly regarding the status of their

clearance and the next steps. UC will continue to hold its Department of Defense Facility Clearance.

National Laboratory Researchers Win 2013 Lawrence Awards

LBNL biologist Adam Arkin, LANL physicist John Sarrao, and LLNL seismologist Stephen Myers were three of six recipients of the 2013 Ernest Orlando Lawrence Award given by Energy Secretary Ernest Moniz. The E.O. Lawrence Award is DOE's highest scientific honor. Secretary Moniz announced the recipients in April 2014.

Mr. Arkin is Director of Berkeley Lab's Physical Biosciences Division and a biologist recognized as a leading authority on the evolutionary design principles of cellular networks and populations and their application to systems and synthetic biology. He was recognized "for his work advancing biological and environmental sciences."

LANL's John Sarrao was recognized "for the discovery and study of new materials, especially those based on plutonium, advancing understanding of unconventional magnetic and superconducting states in strongly correlated f-electron condensed matter systems." Mr. Sarrao has been the Associate Director for Theory, Simulation, and Computation at LANL since March of 2013.

Stephen Myers of LLNL was recognized for his work advancing national security and nonproliferation by developing seismic monitoring technologies to locate nuclear explosions. Mr. Myers conducts research in the Laboratory's Global Security program and leads a collaborative project involving a team of researchers from LLNL, Sandia National Laboratory, LANL, and the Air Force Technical Applications Center.

Among the other scientists recognized nationally with the 2013 Lawrence Award is former LLNL scientist Siegfried Glenzer. Now at the national laboratory at Stanford University, Mr. Glenzer was recognized for his pioneering work to develop and apply a technique known as X-ray Thomson scattering to precisely measure the temperature and other properties of dense plasmas – work that was accomplished during his tenure at LLNL from 1995 to 2013.

LABORATORY PROGRAM HIGHLIGHTS

Lawrence Berkeley National Laboratory

Laboratory Research into Clean Water Now Helping Millions

Berkeley Lab scientist Ashok Gadgil, who is also a member of the faculty at UC Berkeley, set out to solve an insidious public health problem afflicting South Asia – arsenic contamination of groundwater. Mr. Gadgil and his laboratory came up with Electrochemical Arsenic Remediation (ECAR), which binds arsenic using iron dissolved in water. Their innovation created a technology that is exceptionally effective, inexpensive, and easy to maintain. Just as importantly, they conceptualized a business model for implementing the technology in a way that creates

incentives for its longevity. Indian company Luminous Water Technologies has licensed ECAR and plans to bring it to arsenic-affected villages throughout India and Bangladesh.

ECAR was invented at LBNL with Laboratory Directed Research and Development funds with subsequent development done at UC Berkeley. Funding also came from the Environmental Protection Agency, the UC Berkeley Blum Center for Developing Economies, the Sustainable Products and Solutions program (hosted on the Berkeley campus at the Haas School of Business with funding from Dow Chemical Company) and the Development Impact Lab at the U.S. Agency for International Development – part of the U.S. Department of State. ECAR follows Mr. Gadgil’s earlier successful effort, UVWaterworks, developed entirely at LBNL and now licensed to WaterHealth International, Inc. It now delivers affordable safe drinking water to five million poor people daily in six countries in Asia and Africa.

Lawrence Livermore National Laboratory

Biofuel Research

LLNL scientists – working with collaborators from the DOE’s Joint BioEnergy Institute (including colleagues at LBNL and UC Berkeley) – performed an interspecies transplant of bacterial genetic material that could enable a new approach to production of biofuels. Special solvents are typically used to extract cellulose from biomass to make it available for conversion to biofuels. Unfortunately, these solvents are also toxic to biofuel-producing bacteria. To overcome this barrier, the research team identified a pair of genes from a soil microbe native to Puerto Rican tropical rainforests that provide resistance to the solvents. The team then spliced these genes into a different strain of bacteria that is used to produce advanced biofuels. With this genetic enhancement, the improved bacteria were able to survive and thrive in previously toxic conditions. The research is aimed at producing new types of liquid biofuels that go beyond ethanol and attempting to produce compounds that some day may be a substitute for gasoline or diesel as a transportation fuel.

Groundwater Ambient Monitoring and Assessment Program (GAMA)

For more than ten years, the California State Water Board has partnered with LLNL and the U.S. Geological Survey to monitor the state’s groundwater quality and to develop new tools for managing this precious resource. For example, many water agencies are now storing water in underground aquifers to cope with increasingly important water supply issues. These operations typically introduce “tracers” in the water to determine where the stored water is going underground, so it is important to be able to measure the tracers efficiently and accurately. A recent research effort led by a Lawrence Livermore postdoctoral scholar has now developed a new analytical approach for real-time measurements of tracers – in this case inert gases like helium, neon, and xenon – in water samples. The new LLNL instrument enables studies of groundwater flow at managed aquifer facilities, delivering an accuracy comparable to traditional methods, while reducing the measurement time by a factor of ten. It is now being employed by both California municipalities and larger California water districts in their water management programs.

Los Alamos National Laboratory

Laboratory-made Mini Human to Screen Drugs and Toxins

ATHENA, the Advanced Tissue-engineered Human Ectypal Network Analyzer project team, is developing four human organ constructs – a lung that breathes, a heart that pumps, a liver that metabolizes, and a kidney that excretes – all connected by a tubing infrastructure much akin to the way blood vessels connect our organs. Each organ component will be about the size of a smartphone screen, and the whole ATHENA “body” of interconnected organs is sized to fit neatly on a desk.

Some 40 percent of pharmaceuticals fail their clinical trials and there are thousands of chemicals whose effects on humans are simply unknown. Providing a realistic, cost-effective, and rapid screening system such as ATHENA, with high-throughput capabilities, could provide major benefits to the medical field, screening more accurately and offering a greater chance of clinical trial success.

Research and Development Consortium for Nuclear Arms Control Technologies

LANL is partnering in a University of Michigan-led consortium that has been awarded a \$25 million grant – \$5 million per year for five years – by the NNSA. The consortium of thirteen universities and eight National Laboratories is dedicated to the research and development (R&D) of nuclear arms control verification technologies, including nuclear safeguards effectiveness.

“Los Alamos is excited to participate in the consortium as it will help us bring our long and unique history of nuclear expertise to a new generation of researchers who are passionate about national-security science,” said Nina Rosenberg, director of the LANL’s Nuclear Nonproliferation and Security Program. “Moreover, we will see significant benefit to our Laboratory through strengthened connections with the academic community.”