MSEL contributions to the *2009 American Recovery and Reinvestment Act* (ARRA)

The ARRA and NIST

The American Recovery and Reinvestment Act of 2009 (ARRA) is an unprecedented effort to jumpstart our economy, create and save jobs, and to address long-term challenges to our Nation's economic security. It includes measures to modernize our nation's infrastructure, enhance energy independence, and preserve and improve affordable health care. The ARRA provided $610 million in funding to NIST. Of this total, $360 million is for construction and renovation of laboratories, including a $180 million competitive construction grant program for scientific research buildings outside of NIST. Another $30 million funds NIST to develop standards for secure interoperability of medical records, and to enable a smart grid for the U.S. electric power system. Finally, $220 million is directed towards NIST research supporting economic growth and U.S innovation through funding of advanced measurement equipment, competitive grants, and research fellowships.

ARRA implementation in MSEL

MSEL received nearly $7 million for scientific equipment for measurement and standards research in support of NIST priorities and national needs, including key MSEL programs in physical infrastructure remediation, advanced energy, environmental health and safety of nanomaterials (nanoEHS). MSEL staff responsible for procuring this equipment are employing rigorous project management procedures to ensure ARRA funds are dispersed as quickly as possible, while assuring that the highest quality instruments are purchased with public funds. By 2011, six new MSEL facilities will be enabled by ARRA:

Near-Edge X-ray Absorption Fine Structure (NEXAFS) Microscope: This instrument will be installed as part of the NIST beam line at the National Synchrotron Light Source (NSLS) user facility at Brookhaven National Lab. This unique equipment will provide precise chemical analysis and imaging at the ten-nanometer scale. This will enable measurements of the chemistry and structure of nanoparticles needed to assess potential health risks, and of the structure and properties of materials to be used in next-generation organic and inorganic photovoltaic devices. ARRA funds were employed to commission this device in 2010 through a Small Business Innovation Research (SBIR) grant.

Imaging X-ray Photoelectron Spectroscopy (XPS) System: An imaging XPS can spatially map the composition and chemical state of surfaces and surface bound species. To be installed in 2010, this state of the art instrument will include an integrated chemical reaction chamber and capability for automated measurement of multiple samples. The instrument will bolster the MSEL nanoEHS program by enabling measurement of the surface chemistry of nanomaterials; providing information necessary to determine nanoparticle functionality and gauge potential nanoparticle health and environmental risks. ARRA funding will also enable refurbishment of the laboratory space in which this instrument will be housed.

Organic Photovoltaic Characterization Facility: A series of glove boxes completely outfitted with characterization equipment, this facility is critical for fabrication, testing, and developing device-relevant measurements to facilitate next-generation photovoltaic devices based on organic molecules. The new facility will be central to an emerging MSEL program in advanced solar energy technology. When fully operational in 2011, this facility will enable new measurements and methods that will play a central role in helping industry to develop and manufacture light, flexible solar panels that are reliable and cost effective.

Non-Linear Optical Interfacial Spectroscopy System: Slated to be operational in 2010, this time-resolved optical spectrometer will perform both vibrationally resonant Sum Frequency Generation and Coherent Anti-Stokes Raman Scattering measurements in polymer thin films and interfaces. These capabilities, being co-developed with MSEL and the Chemical Sciences and Technology Laboratory (CSTL), will enhance NIST's efforts in the area of materials for advanced energy storage and deliver. In particular, it will enable measurements that assess the function, stability and reliability of advanced energy storage devices such organic photovoltaics, fuel cells, and batteries.

850-00-05

Metal Formability Test Facility: This facility will enable x-ray strain measurements of metal sheet during the complex multiaxial deformation routes that are inherent to automotive part manufacture. When it is installed in 2010, it will be the centerpiece of MSEL's NIST Center for Metal Forming, which has extensive interaction with U.S. automakers. Measurements from this facility will allow the automotive industry to more rapidly and economically develop means for fabricating reliable car components from advanced lightweight alloys, like those of aluminum and magnesium, and high-strength steels, supporting the manufacture of energy efficient vehicles.

High-strain-rate tensile test system: The strength of most structural materials changes as the rate at which they are deformed changes, so accurately modeling the response to blast and impact requires data obtained under similar loading conditions. This test system will provide material data necessary to evaluate and model vehicle crashworthiness and failure of infrastructural systems such as petroleum pipelines. When it is commissioned in late 2010, it will complement the existing MSEL compression Kolsky bar, which can probe even higher deformation rate conditions. Along with a planned tension Kolsky bar, scheduled to come on-line in 2011, these three test machines will form a world-class facility for high-deformation-rate measurements.

MSEL staff also contributed significantly to the other NIST-ARRA fund expenditure plans. Foremost, was the extensive amount of time and technical expertise they contributed to the NIST-ARRA Grants Program, and the NIST-ARRA Construction Grants Program. During 2009, over 80 MSEL staff members completed over 400 reviews of the nearly 1500 scientific proposals submitted to these programs. These thorough reviews, many of which required the specific technical expertise of the participating scientists, were essential for reliable selection of the best possible proposals for award. In addition, over 10 MSEL staff worked to organize the review process, and served on the committees that guided final award selections.

ARRA funds also provided numerous employment opportunities for postdoctoral fellows in MSEL. In 2009, over 30 of MSEL's postdoctoral fellows were completely funded, or had their tenures extended, by ARRA awards. This allowed a significant portion of MSEL's postdoctoral force to start or continue working on priority programs. In addition, in 2010 MSEL is slated to take on 12 more ARRA funded postdoctoral associates through the NIST-ARRA Associateship program.

To learn more about how NIST is contributing to the 2009 American Recovery and Reinvestment Act, visit http://www.nist.gov/recovery.

Contact

Michael Fasolka, Acting Deputy Director
Materials Science and Engineering Lab
(301) 975-8526
mfasolka@nist.gov