

**VISITING COMMITTEE ON ADVANCED TECHNOLOGY (VCAT or Committee)**  
**MINUTES OF THE TUESDAY, OCTOBER 24, 2023**  
**WEBINAR MEETING**

**ATTENDANCE:**

**Visiting Committee  
Members Attending**

Cerf, Vinton  
Fischer, George  
Ghosh, Monisha  
Jackson, Keoki (Dana)  
Johnson, Anthony M.  
Khan, Mehmood  
Ku, Katharine  
Matusow, Jason  
Pierpoint, Mark

**Designated Federal Officer**

Shaw, Stephanie

**NIST Leadership Board**

Adams, James  
Bahar, Mojdeh  
Boehm, Jason  
Brockett, Del  
Chin, Joannie  
Fangmeyer, Robert (Bob)  
Folk, Alex  
Hooker, Stephanie  
Jenkins, George E.  
Johnson, Janelle  
Kushmerick, James  
Locascio, Laurie  
Mackey, Elizabeth (Liz)  
Raghavan, Pravina  
Romine, Charles (Chuck)  
Sastry, Chandan  
St. Pierre, James  
Szakal, Christopher  
Vaughn, Robert (Skip)  
Wixon, Henry

**NIST Staff**

Andrews, Anne  
Averill, Jason  
Ayala, Melissa  
Barbosa, Nicholas  
Berilla, Michael  
Bobb, Beverly  
Boeckl, Kaitlin (Katie)  
Boggs-Russell, Ashley  
Brown, Hannah  
Buchanan, Kerriane

Carnahan, Lisa  
Cheng, Adrienne  
Conrad, Brad  
Cubert, Amy  
Dickson, Jessica  
DiVietro, Jeffrey  
Dohne, Kirk  
Fasolka, Mike  
Gayle, Frank  
Gillerman, Gordon  
Glenn, Rachel  
Greer, Chris  
Huergo, Jennifer  
Ipri-Brown, Susan  
Jahanmir, Said  
Jones, Christina  
Kagan Guthrie, Benjamin  
Knake, Maria  
Lane, Anne  
LaSalle, Connie  
Lawson, Jeremy  
Lin, Eric  
Lin-Gibson, Sheng  
Malhotra, Jyoti  
Martin, Natalia  
Mayton, Heather  
Meritis, Dimitrios  
Midzor, Melissa  
Morrow, Jayne  
Moylan, Shawn  
Phillips, Brandy  
Porch, Susanne  
Reidy, Kari  
Rogers, Kelley  
Rudnitsky, Robert  
Ryan, Christopher  
Sberegavaeva, Anna  
Schiel, John  
Schlatter, Katie M.  
Schmidt, Mark  
Schufreider, James (Jim)  
Sedgewick, Adam  
Seiler, David (Dave)  
Sharpless, Kathy  
Shepard, Scott  
Sofka, Holly  
Stambaugh, Corey  
Stephens, Amelia  
Stephens, Michelle  
Strickler, Jessica  
Sullivan, Suzanne

Shyam-Sunder, Sivaraj  
Vanek, Anita  
Vanlandingham, Mark  
Weiss, Lora  
Whiteside, Teresa

**Others**

Cassady, Amber – Lewis-Burke  
Associates LLC  
Lancaster, Veronica – U.S.  
National Committee of the  
IEC Consumer Technology  
Association, producer of  
CES®  
Lockett, Mia - Lewis-Burke  
Associates LLC  
McKenzie, Lindsay - Science  
Policy News American  
Institute of Physics  
Saunders, Mary – American  
National Standards Institute  
Updyke, Craig – ASTM  
International

Tuesday, October 24, 2023

## Call to Order – Dr. Mehmood Khan, VCAT Chair

Dr. Jackson, VCAT Vice Chair, called the meeting to order at 10:00 a.m. He reviewed the meeting logistics and took roll call before turning the meeting over to Dr. Locascio.

## **SESSION I: NIST PROGRAMMATIC UPDATES**

### Agenda Review and NIST Update – Dr. Laurie Locascio, Under Secretary of Commerce for Standards and Technology and NIST Director

After summarizing the agenda, Dr. Locascio shared new leadership roles at NIST. She welcomed Ms. Janelle Johnson as the new Director of the Diversity, Equity, and Inclusivity Office (DEIO), and Dr. Jim Adams was selected as the Director for the NIST Center for Neutron Research (NCNR). Some leadership changes in the standards area, pending DOC approval, include Dr. Jayne Morrow as Interim Standards Executive and Dr. Shyam Sunder as Acting Director of the Standards Coordination Office, held previously by Mr. Gordon Gillerman. Mr. Gillerman has detailed into the position of Advisor for Standards and Conformity Assessment Capability Planning in the office of the Associate Director for Laboratory Programs (ADLP). Dr. Locascio shared leadership changes in the CHIPS R&D (research and development) program area, which included Dr. Jay Lewis as Director of the National Semiconductor Technology Center (NSTC), Dr. Subramanian Iyer as Director of the National Advanced Packaging Manufacturing Program (NAPMP), and Ms. Briana Frisone as Senior Advisor for CHIPS for America.

The format of the presentation covered three main areas:

1. Artificial Intelligence (AI)
2. Climate and Environment
3. Selected NIST Highlights

1. Artificial Intelligence. With a robust AI research portfolio, NIST is seeking to advance and promote trustworthy and responsible use of AI while ensuring safety and trust in the design and development of AI systems. Engagement with the private sector helps NIST to take the lead, both in the U.S. and abroad, in development of guidance, tools, and frameworks.

By collaborating with the larger AI community, NIST created the NIST Generative AI Public Working Group that convened in July to manage the risks associated with generative AI technologies. The group will use the NIST AI Risk Management Framework (RMF) to produce a "profile" specifically for generative AI focusing on four guideline areas: governance, digital content provenance; pre-deployment verification and validation; and incident disclosure. The group is on target to have a draft of four sets of guidelines that align with the four guideline areas later this year.

Another way NIST engaged with the AI community is through its role as Secretariat to the National AI Advisory Committee (NAIAC), consisting of 20 leaders from the private sector, academia, nonprofits, and civil society. Together they advise the President and the National AI Initiative Office at the White House on all topics related to AI. The NAIAC is in its second year with recently realigned efforts to explore the impacts of AI on workforce, equity, society, and other areas. There have been six public meetings to date, bringing speakers together to discuss the latest developments and the impacts of AI. So far, the NAIAC has published several documents, including a recommendation to ensure emerging economies are represented in global AI gatherings, a clear priority to both the White House and the Department of Commerce Secretary, Gina Raimondo.

NIST continues to be sought after to contribute to conversations around AI through international engagement. In October, a crosswalk was published between the NIST AI RMF and Singapore AI Verify as part of the Singapore critical and emerging technologies (CET) dialogue. Additionally, a joint workshop was held in September on risk management for AI systems with ANSI (American National Standards Institute) on how to use tools like the AI RMF and ISO (International Organization of Standardization) and IEC (International Electrotechnical Commission) standards to demonstrate responsible AI. Dr. Locascio attended an AI

Governance Forum in Seattle, hosted and organized by U.S. Senator Maria Cantwell, to discuss opportunities and challenges that exist with AI. She also applauded and wanted to recognize NIST's Ms. Elham Tabassi who appeared in Time Magazine's list of 100 most influential people in AI for her leadership in developing the NIST AI RMF. NIST expertise, experience, and leadership will continue to be needed to find solutions to AI challenges. Working with the UK's National Physical Laboratory (NPL), the Turing Institute, and Department of Science, Innovation, and Technology on AI risk definitions, evaluations, and standards, NIST will continue engagement in future fora. A joint webinar on AI RMF is being planned for this winter. NIST looks forward to strengthening and continuing engagement with the private sector, academia, and other partners in the federal government to collaborate on joint R&D projects to advance a complete understanding of AI systems.

2. Climate and Environment. Dr. Locascio highlighted a few programs and recent accomplishments in NIST's extensive climate and environment portfolio, which is built on three pillars: climate and monitoring measurements with programs such as greenhouse gas metrology; decarbonization of the economy, containing many circular economy efforts; and adaptation and resilience, extending into NIST's disaster investigations.

- *Climate and Monitoring Measurements*: NIST is one of four implementing agencies of the U.S. Greenhouse Gas Center, a multiagency effort facilitating coordination to integrate and enhance greenhouse gas data and modeling capabilities. Such measurements can provide unique multiscale information on greenhouse gases to inform research and application, a really important role for NIST. NIST investigates the accuracy of emission data through the Urban Dome Institute Tower Network to develop measurement tools and support independent means to diagnose the accuracy of greenhouse gas inventory in complex settings. In conducting measurement science research, NIST and the Department of Defense (DoD) conceived and experimentally evaluated nonflammable refrigerant replacements with a 50 percent to 66 percent reduced global warming potential.
- *Decarbonization of the Economy*: NIST assists in decarbonization of the economy efforts through development of new standard and calibration services for photovoltaics that reduce reliance on fossil fuels. Through the circular economy program, NIST focuses on standards, assessments, and the technology to minimize waste and return valuable material resources to the supply chain, which is most visible for plastics. The U.S. is currently engaged in international negotiations or a treaty to reduce the impact of certain plastics in the environment, which is challenging due to the necessity of plastics for certain products, such as medical devices. NIST is collaborating in Hawaii, where plastics are being repurposed and integrated into roadway asphalt, and assessing the runoff to determine if there are any health and environmental issues caused by microplastic and nano plastic release from these roads.
- *Adaption and Resilience*: NIST continues to provide guidance in ongoing wildfire efforts. NIST recently published a pair of reports based on analysis of a campfire from Paradise, California that addressed the evacuation and sheltering challenges that occur in fast-moving wildfire events, including specific actions communities can take to save lives and safely evacuate residents. A hazard mitigation methodology website was launched in late August to provide a science-based wildfire protection approach for making built structures and entire communities more resistant and resilient to fire. Dr. Locascio also updated three NIST disaster investigations: Maui wildfires, Hurricane Maria, and the collapse of the Champlain Towers South. A National Construction Safety Team (NCST) investigation is not currently planned for the Maui wildfires, but other research studies are an option. A reconnaissance team has been deployed to focus on evacuation and emergency communications. There is an ongoing NCST investigation exploring the effect of Hurricane Maria on Puerto Rico in 2018. The data collection is now complete, and next steps involve a comprehensive analysis of the collected data and drafting of reports. At a meeting on September 7th, the NCST's advisory committee revealed that the number of slab-reinforcing bars centered over vertical columns was inadequate and the reinforcing bars were spaced further apart than the design required in the Champlain Towers South investigation. Invasive testing is underway, and it is expected that most of the technical work will be completed by June 2024.

3. Selected NIST Highlights: One of NIST's contributions to precision measurement science to support the understanding of the asymmetry of the universe appeared in *Science*, published by NIST JILA (formerly the Joint Institute for Laboratory Astrophysics). This work, which was a record-breaking measurement, set a new upper limit on the electron's electric dipole moment. Describing the work, *Science* said, "This result implies that

any new fundamental particles lurking undiscovered in the vacuum might be too massive for even the world's biggest atom smasher to produce." It is important that NIST continues to push the limits of its fundamental precision measurement science.

NIST released a draft of the Cybersecurity Framework 2.0, the first major update since 2014, which includes improved guidance for implementation of the framework. Because stakeholder input and feedback are crucial, NIST hosted workshops in September to discuss the proposed changes.

NIST participated in the launch of the White House's Internet of Things Labeling Initiative called "Cyber Trust Mark," a program for labeling devices for their cybersecurity. It is led by the FCC (Federal Communications Commission) and not by NIST, but NIST's expertise and resources will be leveraged as a part of this effort. NIST has been tasked to define cybersecurity requirements for consumer-grade routers, which will inform FCC in the broad labeling program.

In August 2023, NIST released a draft of standardized encryption algorithms designed to withstand attack by quantum computers. Three new algorithms are expected to be ready for use in 2024 and will provide tools to protect sensitive information from the threat of quantum computers.

Dr. Locascio shared some CHIPS incentives program activities. On June 23<sup>rd</sup>, the scope of funding announcement was expanded to include applications for commercial facilities for semiconductor materials and manufacturing equipment for which the capital investment exceeds or equals \$300 million. On July 26<sup>th</sup>, NIST and DoD signed a memorandum of agreement (MOA) to expand collaboration to strengthen the U.S. semiconductor defense industrial base with the intention to increase information sharing between departments. Additionally, the final rule implementing the National Security Guardrails of the bipartisan CHIPS and Science Act was released on September 22<sup>nd</sup>. The rule elaborates on two core provisions of the statute, prohibiting CHIPS fund recipients from expanding material semiconductor manufacturing capacity in foreign countries of concern for 10 years and restricting recipients from certain joint research or technology licensing efforts with foreign countries and entities of concern.

NIST has ongoing programs and initiatives in workforce development needed for U.S. technology leadership and economic and national security. For CHIPS incentives, there are specific workforce requirements for receiving funding to build up manufacturing capacity. The proposals for receiving CHIPS funding must include an assessment of job types and skills and workers required, strategies for worker recruitment and retention, and an approach to meeting the Good Jobs Principles published jointly by Departments of Commerce and Labor, and commitments to provide workforce training. NIST's NICE program (formerly known as the National Initiative for Cybersecurity Education) organized a cybersecurity career week to help promote cybersecurity careers and grow the workforce. The Manufacturing Extension Partnership (MEP) program released a new interactive workforce map to showcase MEP's efforts across the country and published ways that centers can help manufacturers overcome difficult workforce challenges. Manufacturing USA released a Notice of Funding Opportunity (NOFO) for Workforce Education and Vibrant Ecosystems (WEAVE) Public Service Awards designed to build diverse ecosystems and pilot new or scale existing initiatives, promoting the transition of institute-developed technologies into commercial use. The National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) Experience Program, sponsored by NIST and DOC (Department of Commerce), supports programming to provide African American, Black, Latinx, and Native American students the opportunity to work directly with biopharmaceutical industry professionals and engage in hands-on activities, illustrating a career in biomanufacturing. NIIMBL was awarded \$370K to support programming in 2024.

Dr. Locascio also provided several facilities updates. The completely renovated Wing 5 of Building 1 on the Boulder campus officially reopened with a ribbon-cutting ceremony held on August 17<sup>th</sup>. It had been closed since 2018 for renovations and now houses 16 labs, some CHIPS R&D programs, and has a cleanroom infrastructure to conduct some of the nanofabrication facility work. In Gaithersburg, a new robot test facility will break ground on October 27<sup>th</sup> and will provide standard methods for measuring robot performance in application domains. At the NIST Center for Neutron Research (NCNR), the reactor operator exams were held in July and NIST is awaiting results from the Nuclear Regulatory Commission (NRC). Additionally, on August 9<sup>th</sup>, an unplanned power interruption initiated an automatic shutdown of the research reactor and ventilation system, but the radiation levels and doses were well below regulatory limits. This was not a reportable event, however NIST did provide a courtesy notification to the NRC.

In quick highlights, NIST quantum researchers responded to feedback from industry partners and, after a three-year effort, completed a dictionary of terms for single photon sources and detectors. It is already receiving attention from standards organizations and other federal agencies. NIST is in the last phase of the First Responder Smart Tracking Challenge competition dedicated to finding new technological solutions to pinpoint exact location and elevation for first responders' safety during search-and-rescue missions and has awarded \$5.6 million in prizes and business development support funding. Kicking off the NIST fall colloquium, Adam Savage will give a presentation on October 26<sup>th</sup> to NIST staff. The MEP National Network Forum was held in September and hosted 600 MEP National Network representatives to discuss industry challenges, understand MEP's evolving role, and to share knowledge. The MEP additionally celebrated its 35<sup>th</sup> anniversary in August. Finally, the Manufacturing USA program will be launching a much-anticipated competition for a new, flexible-topic Manufacturing USA Institute later this quarter.

For more information, see Dr. Locascio's [presentation](#).

**Discussion.** The group discussed the following topics:

- Other areas where NIST can help over the next three months on AI guidelines,
- Proposal of a new AI collaboration center of excellence in the NIST budget proposal,
- Quick and agile new ways to be responsive to standards technology,
- Further communication to the public on what NIST is doing, especially in critical and emerging technologies,
- Due to retirements, NIST communications staff has been downsized,
- Ensuring the Cybersecurity Framework is adopted in the international arena,
- Status of refurbishing and improving laboratories,
- Adherence and conformity to the Cybersecurity Framework,
- Cybersecurity and AI components brought together instead of looked at separately,
- Goal for the Cybersecurity Framework to be a voluntary consensus-drive product,
- Driving awareness, education, and adoption in the cybersecurity area,
- Working with the public through FFRDCs (federally funded R&D centers) on a profile in AI space, and
- Role NIST plays to act responsibly between the Framework level and controls level.

### **[Safety Update - Dr. Laurie Locascio, Under Secretary of Commerce for Standards and Technology and NIST Director, and Dr. Elizabeth Mackey, Chief Safety Officer and Director of Office of Safety, Health, and Environment \(OSHE\)](#)**

Dr. Locascio began the presentation by stating that it has been a tough year for NIST following the tragedy that occurred last September at NIST. In December, she commissioned a federal advisory committee consisting of a panel of seven experts, called the Safety Commission, to take a deep look at the safety practices and culture at NIST. After interviewing staff and assessing the safety program implementation, the committee presented a report that provided 17 recommendations to improve safety NIST-wide. Additionally, several NIST executives visited DOE laboratories to benchmark best practices. Dr. Locascio also brought in consultants to conduct a workshop focused on safety culture and to bolster safety leadership. A NASEM (National Academies of Sciences, Engineering, and Medicine) workshop was also held to learn about best practices for managing laboratory safety in a hybrid work environment. NIST will need to make structural changes to improve elements of their safety management system, strengthen the roles and responsibilities of the NIST safety staff professionals, and integrate safety into decision-making. A renewed focus on safety culture will require everyone at NIST to accept personal responsibility for safety, hold each other accountable, and make sure actions reflect the safety values.

Dr. Mackey said the first six months of FY23 was busy with corrective and improvement actions. A deep incident investigation was conducted that yielded 41 corrective actions. A Safety Culture Survey was also held in the summer to develop a safety culture improvement plan that yielded nine improvement actions.

After the fatality at the National Fire Research Laboratory, Dr. Locascio asked for a safety stand-down day within one week for NIST staff to pause, stop their work, and think. Listening sessions were held, and a FY23 initiative requires all people whose work is covered by a JHA (job hazard analysis) to reassess the hazard review and ensure they're adequate. All hazardous work that occurs at NIST must be covered by a JHA. An

incident investigation action plan was developed with correction actions at the OU (organizational level) level in three key areas:

- Strengthen requirements for and improve NIST Hazard Review Program,
- Improve line management oversight of hazardous work and accountability with respect to safety, and
- Address gaps in NIST's safety management systems (SMS).

Of the 26 corrective actions, NIST is about 65 percent complete. NIST also convened a subcommittee of the Executive Safety Committee to look at this report and look more broadly across all NIST. This led to the addition of some specifics to the Hazard Review Program requirements, like pre-job briefings and a focus on controls.

Dr. Mackey said two additional safety management system gaps were found. First, NIST does not have a construction safety program. The corrective and preventive action program needs to be broader and fall hazard mitigation needs to be done more consistently and sufficiently. Another gap is refresher safety training, which needs to be expanded and held regularly. Dr. Locascio has communicated safety expectations broadly with NIST town halls and to look at supervisor performance and review safety-related roles and responsibilities, specifically of OSHE staff. A requirement to improve communication on lessons learned specifically to incident investigations is an area that needs to be communicated more broadly.

For recommendations provided by the Safety Commission, actions are underway to address OSHE structure, roles, and responsibilities. Dr. Mackey's role was strengthened as Chief Safety Officer and names her position now as Special Assistant for Safety to NIST Director and is required to report quarterly at a minimum and more often as necessary. Dr. Mackey also has been made a voting member of the Enterprise Risk Management Council to ensure safety considerations are elevated at the enterprise level. The Safety Commission recommends that OSHE staff lead inspections and verify correction action closeouts, and a program revision is underway to make those changes and will specify when a safety subject-matter expert must participate in a hazard review or incident investigation. External contractors will be hired to assess OSHE positions within NIST, expertise, staffing, and organizational structure. The ratio of safety staff to staff at NIST is insufficient compared with other governmental laboratories, and Dr. Mackey has received approval to hire 12 new safety staff. The first one has been positioned at the NCNR and five more to be embedded within the other OU's will be coming in FY24.

Another recommendation from the Safety Commission is to review the risk matrix to assess risks and include a probability time frame in addition to the likelihood of the risk occurring. Workplace inspections must enforce a time frame for abatement. Improvements are being made to incident investigation reporting where staff can fill out a simple form anonymously, and refresher training is going to be required. Training is being provided for managers on how to conduct meaningful conversations about hazardous work and observations. The Management Observation Process program has been in place since 2012, but managers want to know how to do a better job, therefore NIST is bringing in consultants to provide that training.

Change management was found to be fundamental in causal factors associated with the NCNR incident. In 2024, NIST is planning to implement tools in place to help guide a safety exit from duty checklist and when hiring new managerial staff. Contractors will do an external assessment to ISO 45001 standard through the Audits and Assessment Program, with routine, rotating internal and external audits in this program. A practice to routinely benchmark the full SMS with other organizations will be conducted. Finally, a safety metrics dashboard is partially completed and will establish a review panel to review commercially available products, assess in-house software, and make improvements as needed.

In the next two years, \$9 million will be spent to improve fall hazard assessments for all buildings on both campuses, to include roof rail installation for all buildings where rooftop work occurs to avoid a serious incident or fatality. Approximately \$1 million has been invested for safety consultation services to evaluate the improvement action plan and timeline.

Performance agreements have been revised to include a standalone safety element for anyone who oversees hazardous work and will be in performance plans for managers going forward. An Annual Safety Rules and Behavior for all employees and associates will be required in everyone's curriculum. The NIST general safety and leadership safety training modules will be updated to emphasize the importance of culture.

The National Safety Council (NSC) Barometer Study results was shared with staff on how NIST compares with others. Multi-OU and multilevel teams from each campus developed action plans addressing low-scoring items and ways to improve them. In a Safety Culture Survey, NIST scored in the top 30 percent of 156 similar organizations and in the top 36 percent of all companies in the NSC's database, and the 36 percent, or 64<sup>th</sup> percentile, is not ideal. NIST's strength was supervisor engagement, and low-performing elements were employee involvement, support activities, safety, support climate, and management commitment.

For more information, see Dr. Locascio's and Dr. Mackey's [presentation](#).

**Discussion.** The group discussed the following topics:

- Challenges around safety due to under-investment over time in facilities,
- Research dollars used for facilities maintenance and improvement of infrastructure,
- Categorizing safety needs when asking for funding to Congress,
- Include the problem of tradeoffs between mission and safety in VCAT annual report,
- Visiting staff receiving annual training requirement,
- Structure safety training to levels of severity,
- Basic safety training is assigned as soon as folks are onboarded,
- Activity-specific hazard reviews will occur before work is permitted,
- Provide medical training to employee volunteers to be first responders on-site,
- Expanding training to Boulder campus staff to fill gaps due to lack of on-site fire department,
- In-person training sessions more effective than online, and
- How to interpret benchmarking ratio of 160:1 NIST staff to safety staff ratio compared to 40:1 for DOE.

### **Conversation with NIST Diversity, Equity, and Inclusivity (DEIO) Director – Ms. Janelle Johnson, NIST DEIO Director**

Ms. Johnson started off with providing her vision for leading NIST, and the first principle is that all NIST will be united behind a single, one-line statement regarding DEIA (Diversity, Equity, Inclusion, and Accessibility). The second principle is uniting aspiration with implementation to ensure DEIA is reflected in NIST's culture and climate, and the third principle is building and sustaining an organizational commitment to DEIA.

She stated that NIST has a great reputation across the federal landscape and highlighted several strengths that NIST brings to the DEIA work. One is the commitment to measure. The second is the data-driven approaches. She said NIST has matured from level one, foundational capacity, to level two which is advanced outcomes. Ms. Johnson stated with hard work and working together as a community, NIST will advance to level three, which is leading and sustaining. Lastly, Ms. Johnson stated that diversity, equity, and inclusion in STEM gives people with different backgrounds and identities an opportunity to participate and contribute their perspectives.

**Discussion.** The group discussed the following topics:

- What vision of success will look like in the future for DEIA at NIST,
- Institutionalized inclusion example would be inclusive team selection for projects and jobs based on performance and diverse skill sets,
- Challenges with multigenerational diversity,
- Pressures to eliminate DEI budgets from some outside of NIST affecting efforts, and
- Holistic approach to making sure NIST is a people-first culture.

## **SESSION II: PROGRAMMATIC UPDATES**

### **CHIPS Updates - Dr. Lora Weiss, Director, CHIPS R&D Office**

Dr. Locascio introduced Dr. Weiss, the new CHIPS R&D Director, who came from Penn State University. She has a research background in robotics, unmanned/autonomous systems, and AI, which will complement the chips and semiconductors work. Dr. Weiss stated the vision of the CHIPS R&D Office is a self-sustaining U.S. domestic semiconductor ecosystem that revitalizes American manufacturing, grows a skilled and diverse workforce, and leads the world in semiconductor research and innovation. The mission will be to accelerate the

development and commercial deployment of foundational semiconductor technologies by establishing, connecting, and providing access to domestic tools, resources, workers, and facilities.

There are three areas of focus for the vision, first, U.S. technology leadership; second, accelerated ideas to market; and third a robust semiconductor workforce. These three areas are tied to an aggressive R&D program to have a vibrant, innovative, successful semiconductor sector 10 years from now and beyond.

There are four fundamental research programs in the CHIPS R&D Office:

1. National Semiconductor Technology Center (NSTC)
2. National Advanced Packaging Manufacturing Program (NAPMP)
3. Manufacturing USA Institute(s)
4. NIST Metrology Program

Underpinning all this is workforce development and will require hundreds of thousands of talented people in the next decade to keep the sector vibrant to manufacture and package the chips onshore.

Dr. Weiss provided a timeline for the four research programs. The NSTC published a vision and strategy paper last spring. Then a selection committee was appointed to identify a board of trustees, which was recently announced. They are looking to hire a CEO (Chief Executive Officer) to start moving forward with activities. The NAPMP will be releasing a vision and strategy document soon with intentions on rolling out some packaging programs and opportunities. The Manufacturing USA program put out a RFI (Request for Information), which received a lot of good feedback, and an announcement will be coming out soon on the topics being pursued for upcoming Institute(s). A metrology gaps report was published that also included a vision and strategy document, which identified seven grand challenges, two of which have started to be funded. The vision and strategy papers are available at <https://www.nist.gov/chips/publications>. In September, the CHIPS R&D Interagency Semiconductor Standards Group hosted a Standards Summit. It was a hybrid summit which was well-attended, with more than 200 attendees in person and 400 attendees online. A report will be forthcoming with findings to address the need to coalesce around international standards for semiconductors.

Dr. Weiss provided an update on the current leadership team. She also provided a list of the NSTC inaugural board of trustees and the selection committee that chose them.

The Industrial Advisory Committee (IAC) have regular meetings to hear from industry about their needs, concerns, and thoughts. The meetings rotate between virtual and in person. The Committee consists of at least 12 members which serve three-year terms and may serve up to two consecutive terms. The next meeting will be virtual and will be held on November 8, 2023.

For more information, see Dr. Weiss' [presentation](#).

**Discussion.** The group discussed the following topics:

- Role NIST will play in the CHIPS R&D arena with other federal entities, e.g., DoD, DOC, and National Science Foundation,
- Interagency collaboration to keep NIST aligned with other federal entities and avoid duplication,
- NIST is a part of DOC, and CHIPS is a NIST and DOC activity,
- Innovation pipeline is important for tech transition and acceleration to commercialization,
- How does the U.S. compare with global competitors in the international market,
- Teaming opportunities with academia to provide larger opportunities for success, and
- U.S. Standards Strategy on Critical and Emerging Technologies for global coordination.

### **Subcommittee on U.S. International Standards Development Activity – Mr. Jason Matusow, Subcommittee Chair, and Dr. Jayne Morrow, NIST Senior Advisor for Standards Policy**

Mr. Matusow reminded the VCAT that earlier this year the White House released the U.S. Standards Strategy for CETs and as part of the launch event, Dr. Locascio established the Subcommittee on U.S. International Standards Development Activity in which he was asked to Chair. This subcommittee was tasked to develop specific recommendations that assess the opportunities to enhance NIST's engagement in, support of, and



coordination policy efforts in support of international standards development activity. The subcommittee is charged to report their findings to the VCAT and finalize recommendations on the following three topic areas:

- Barriers to U.S. participation in standards development activity,
- Opportunities to increase professional CET sectors engaged in standards development activities, and
- Opportunities for NIST to work effectively with private-sector stakeholders.

The subcommittee consists of two VCAT members, Mr. Matusow, Chair and Dr. Vinton Cerf, academics, and visiting experts who are leaders in standards bodies from an industry or civil society perspective. Eight listening sessions have been scheduled with experts from the standards community or people in adjacent organizations such as National Labs, academics, or other FACA (Federal Advisory Committee Act) committees. The individual assessments of the Subcommittee will be used to create a list of recommendations for the entire VCAT to discuss and finalize. At the February 2024 VCAT meeting, the final recommendations will be disseminated to NIST.

Preliminary findings are that there has been a very positive response from the community, with a strong endorsement of the public-private partnership and the need for strong coordination with the U.S. and like-minded nations. There is a concern to be cautious and aware that the U.S. standardization system is designed to be an industry-led voluntary system, and so there is a balancing act as to how far and where the government should step in. The U.S. has 700 standards bodies providing a spectrum approach for U.S. economy and innovation to be dynamic and fluid. Open-source software inclusion is another area of focus on how it interacts with and around standardization.

Small and medium enterprises and their engagement in standardization is a long-standing challenge and an expensive process, but it is deeply needed. The pre-standardization front is the best opportunity for positive impact. Mr. Matusow stated embracing the fact that CETs have become national competitive interests and/or national security interests, these dynamics are important, and while it may not define a given standard, it certainly can help to frame the types of standardization work that needs to get done. An outcomes-based approach looking at standardization, one that avoids a simplistic context, is needed. Attention needs to be given to workforce development, investing in academia, and mid-career training.

Dr. Morrow said that in parallel to the work of the subcommittee, NIST has been working hard to stand up a team to look at developing an implementation plan for the Strategy. Dr. Morrow leads the U.S. Government National Standards Strategy for Critical and Emerging Technology team which was assembled to develop an implementation plan within a year.

A RFI was developed and went live September 7, 2023. Published in the Federal Register, the RFI is seeking public input on how to best implement the Strategy, seeking input on investment, participation, workforce, and integrity and inclusivity. Responses are due on November 6, 2023, but may extend into December to hear from additional professional societies and academic institutions. An initial introduction webinar working with the White House, Office of Science and Technology Policy (OSTP), National Security Council, and others will be held to share the work of the strategy, which will provide an opportunity for more feedback on the RFI.

Several listening sessions have been held around the country with four more to go. The purpose of these sessions is to draw attention to the strategy and work as well as to encourage people to engage in the standards development activities. Some of the locations of the listening sessions are San Diego, California in December, one in Seattle, Washington focused on a technical area, and Huntsville, Alabama, on November 27, 2023, focusing on technology risk and understanding the roles of standards. This will be co-hosted by the FBI (Federal Bureau of Investigation), NSA (National Security Agency), and other intelligence community members. The listening sessions are structured around understanding the innovation ecosystem, how standards are built into the system, and how to share more broadly with the community. One surprising element of discussion from the Detroit listening session about the practical application of technology areas is the technology convergence happening in many ways as well, which makes standards development uniquely challenging. Dr. Morrow said her teams' timeline is to wrap up the RFI in December and process the feedback through January and early February.

For more information, see Mr. Matusow's and Dr. Morrow's [presentation](#).

**Discussion.** The group discussed the following topics:

- Challenge with getting academics involved in standards-related activities,
- Interoperability of systems to push innovative ideas into standards in the future,
- Not all CETs created equal in terms of how standards affect progression of particular domains,
- Push needed to have different pre-standardization conversations to make the standards system vibrant,
- Dealing with intellectual property (IP) when the international community is brought in,
- Critical step for Standards Developing Organizations (SDOs) is for them to proactively publish their IP policies up front,
- Need to communicate better externally about listening sessions to communities of interest,
- Gap in digital services reaching different environments globally,
- Communications and standards engagement,
- Taking biology to the molecular level in biomarker development, and
- Dynamics between research, standards development, regulations, and implementation.

### **SESSION III: DISCUSSION WITH VCAT ON CETs: BIOTECHNOLOGY**

#### **Discussion with VCAT on CETs: Biotechnology – Dr. Christopher Szakal, Acting Director, NIST Program Coordination Office, and Dr. Sheng Lin-Gibson, Chief, Biosystems and Biomaterials Division**

Dr. Szakal explained that what is driving the bioeconomy is there is a recognition that biology and biomanufacturing provide solutions to pressing societal issues related to human health, climate, food security, and others.

Biotechnology is a technology that applies to and/or is enabled by life sciences innovation or product development. Biomanufacturing is the use of biological systems to produce goods and services on a commercial scale.

Executive Order (E.O.) 14081, Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy, was signed just over a year ago after multiple years of development. This was an NSC-led effort across two administrations intended to launch the National Biotechnology and Biomanufacturing Initiative (NBBI) and is a whole-of-government approach to advance biotechnology and biomanufacturing towards innovative solutions. NIST was at the table from the beginning and played a key role in its development and continues to support its implementation. The NIST technical strengths, including NIST's programs in Engineering Biology, Biomanufacturing, and Biological Data and AI, align with the E.O. R&D focus. Areas of NIST involvement in the E.O. include harnessing biotechnology and biomanufacturing R&D, data for the bioeconomy, building domestic biomanufacturing, strengthening the biotechnology workforce, advancing biosafety and biosecurity, measuring the bioeconomy, assessing threats to the bioeconomy, and international engagement. For the first deliverable, NIST developed a process for delivering a bioeconomy lexicon within the interagency group, conducted an inventory of existing terms and definitions, harmonized the definitions across all the equities in the government, and released [the lexicon](#) within 90 days.

The next major task was the identification that R&D in biotechnology and biomanufacturing can enable many different pieces of the bioeconomy. Findings were detailed in the "Bold Goals for U.S. Biotechnology and Manufacturing" compilation report and was a multi-departmental effort, with feedback received from industry roundtables and private-sector entities. The Department of Commerce was assigned to the section on supply chain resilience, entitled "Biotechnology and Biomanufacturing R&D to Further Supply Chain Resilience", with NIST and DOC/OPSP taking on a lead role. Three main themes emerged as areas needing investment in R&D: alternative supply chain pathways, supply chain resilience, and standards and data infrastructure. In promoting and protecting the U.S. bioeconomy, NIST has been asked from across the government to develop standards, databases, and tools to help the implementation of new guidance from the Department of Health and Human Services, which came out in October 2023. This is a quickly evolving area that NIST is trying to respond to accordingly.

Dr. Lin-Gibson gave some examples of the capabilities and platform technologies that NIST has been building, including in bio metrology, engineering biology, and core platforms. There are three key roles in building the next generation bio metrology and engineering biology capabilities to support the U.S. biotechnology enterprise and bioeconomy: advanced bio metrology, unprecedented measurement capabilities to quantify complex living systems and processes; design-build-test-learn in the form of tools, platforms, and data/knowledge to predictively engineer biological systems to accelerate innovation in R&D; and standards and related infrastructure to accelerate technology development and translation/clinical use.

Biology has two complementary sides of biosciences, synthetic engineering biology via microbial systems and via mammalian systems. On the microbiology side, an area that is emerging is the integration of parts and systems to design biological systems. There are parallel programs in the mammalian systems and microbial systems, but the programs on the mammalian systems largely target the human health side of programs. NIST's technical efforts lead to a robust measurement infrastructure intended to support all technology sectors, underpinning the development of reference materials and data, documentary standards, and calibration services. Dr. Lin-Gibson gave an example of the recent advanced biological reference material Genome in a Bottle (GIAB), which is human DNA used to advance sequencing technology development and develop clinical diagnostic tests. NISTCHO, an open access, living reference material for biomanufacturing innovation and collaboration, has been recently released and is used to make monoclonal antibodies. NIST is also beginning to develop reference materials related to viruses and viral vectors and also recently released yeast reference materials for biothreat detection. In addition to the reference materials, NIST is leading in the development of documentary standards, which involves a lot of stakeholder engagement.

NIST has been leading the development of multiple ISO (International Organization for Standards) standards. By leading the global development and documentary standards, the U.S. technical advisory group focused on biotechnology covers everything important to the bioeconomy from biorepositories to analytical methods through bioprocessing, biomanufacturing, as well as data.

More recently, NIST has been focusing on standards and metrics supporting non-health sectors of the bioeconomy. Along with the Imperial College of London and National University of Singapore, NIST held a series of workshops and brought together global stakeholders and experts to identify needed standards to advance bioeconomy.

Dr. Lin-Gibson provided some examples of four recent consortia, though there are more in the works: NIST Genome in a Bottle, NIST Genome Editing, NIST Flow Cytometry Standards, and NIST Rapid Microbial Testing Methods. Additionally, a NIST-FDA joint workshop on measurements and standards for advanced therapy will be held on three different days next week. Another effort is the Research Data Management (RDM) which optimizes outputs by integrating RDM across measurement science, strengthens data reuse and interoperability, enables data-driven discovery and access, enables custom and/or shared laboratory workflows towards end-to-end automation, and enables the development and realization of digital twins. The Engineering Laboratory (EL) has been heavily contributing to some of the ISO documents where they are laying out a framework in developing and operationalizing the digital twins.

A new pilot recently launched on oligonucleotide sequence screening as part of the NIST effort to support biosafety and biosecurity. In 2017, an article was published noting the ease of making smallpox from scratch in a lab. Biology has come a long way since the publication of the article, and with AI technology able to predict a function of sequences, this can be a huge concern in terms of biosafety and biosecurity. Therefore, NIST is working to develop the global standards, along with building laboratory capabilities to stay ahead of the screening mechanisms to really understand how AI can be used to predict function and how to safeguard the use of AI for potential nefarious purposes.

Two biomanufacturing partnerships were mentioned, one with the University of Maryland and NIST through the Institute for Bioscience and Biotechnology Research (IBBR), and the other, Manufacturing USA, sponsor of the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) as well as engagement with two other Manufacturing Institutes focused on biosciences and biotechnology. Dr. Lin-Gibson also highlighted one example of NIST researchers working on data interoperability and data sharing through a big pharma ontology architecture, a way NIST has expanded on existing standards for the pharmaceutical industry.

Dr. Szakal said NIST will continue to play a role in building programs to support the goals of the Executive Order and the National Biodefense Strategy, both now and into the future, which align well with the NIST core mission space of measurement science and standards. DOC Secretary Raimondo is supportive in terms of pushing NIST's role in biotechnology development, and it will continue to be a key growth area.

To highlight one specific area in biomanufacturing, NIST is partnering with the University of Maryland and is proposing a new Center for Bio measurement and Biomanufacturing Innovation (CBBi) at the Institute for Bioscience and Biotechnology Research. The vision is to become a nationally recognized research center for advancing measurements, standards, and data to accelerate development and biomanufacturing of biotechnology products. The focus will be on three main areas; leveraging Federal and State investment in state-of-the-art biological measurement science and standards; actively engaging the local and national biotechnology ecosystem; and educating and training a skilled workforce and next-gen biotechnology leaders. This will promote the biotechnology and biomanufacturing landscape.

For more information, see Dr. Szakal's and Dr. Lin-Gibson's [presentation](#).

**Discussion.** The group discussed the following topics:

- Communicating with industry about reference materials for standards,
- Prevention of NIST recreating inventions or duplication in areas of research by the private sector,
- NIST focus is always to share best practices to enable technology development, but not compete,
- Working with FDA as a partner helps to disseminate the work via workshops,
- Priority areas for biotechnology that would provide the biggest impact,
- Federal government encouraging biomanufacturing in the semiconductor area,
- International competition in biotechnology and biomanufacturing development,
- International commitment/consensus around responsible, ethical application of technologies,
- Fine line between work accepted in other parts of the world versus U.S., and
- Individual economic benefit versus collective community benefit.

## SESSION IV: VCAT Discussion

### Selecting New Strategic CETs for NIST – Dr. Laurie Locascio, Under Secretary of Commerce for Standards and Technology and NIST Director

Dr. Locascio gave a brief history of priority areas that were convened by Laboratory Directors in 2015-2016, which matched the NIST mission and capabilities. There were three main areas: AI, quantum, and biotechnology. She then listed some of the critical and emerging technologies from the White House *Critical and Emerging Technologies List Update*: advanced engineering materials, advanced manufacturing, network sensing, nuclear energy technologies, autonomous systems and robotics, directed energy, financial technologies, human machine interfaces, hypersonics, and space technologies and systems. There are a lot of additional things on the CET list out of the White House. As pertains to the list, she asked the question: How far ahead should NIST be? She also asked if NIST should refresh the list. Another question she asked, what metrics or criteria should be used when evaluating potential prioritization or de-prioritization of a research area?

**Discussion.** The group discussed the following topics:

- Looking at intersections between CETs for future priorities,
- Long-term investment in research and seeding new ideas as well as short-term impact,
- Relating mission and strengths to future priorities and strategic plans,
- Thinking about a framework for a balanced scorecard when evaluating the list,
- Tree diagram assessment of foundational elements and derivative technologies,
- Understanding of what the timeline is for these kinds of technologies,
- Are all the items of the list “actually” critical,
- Breaking the vertical and horizontal split when analyzing the importance of list items,
- Identifying highest criticality and greatest disruption challenges,
- Limitations on rare earth, new materials, or lack of a supply chain to drive technologies forward,
- NIST is uniquely positioned to have long- and short-term timelines, and
- An offsite for the ADLP will be held at the end of February 2024 to discuss the CET list.

## **SESSION V: VCAT PROGRESS AND PLANNING**

### **Discussion with VCAT on February 2024 Meeting Planning – Dr. Christopher Szakal, Acting Director, NIST Program Coordination Office**

Dr. Szakal thanked the VCAT members, NIST staff, and presenters for a productive virtual meeting.

The February 2024 VCAT meeting will be in person, and Ms. Shaw will email the VCAT members with the agenda and information about the VCAT Chair and Vice Chair nominee election ballot. Dr. Szakal thanked Dr. Khan and Dr. Jackson for their past and current leadership, and the results will be announced at the February 2024 VCAT meeting.

VCAT members will receive an email from the DOC Ethics Division to file annual financial disclosures. It must be filed at least three business days prior to the February 2024 meeting.

A working session with just VCAT members will be scheduled in January 2024 for Mr. Matusow, Chair of the Subcommittee on U.S. International Standards Development Activity to present the recommendations accumulated by the subcommittee for discussion and finalization. The final recommendations will be presented at the February 2024 VCAT meeting.

At the February 2024 meeting, the VCAT members will receive an annual ethics briefing. There will also be time set aside to work on the annual report that will be released 30 days after the release of the President's Budget Request.

Dr. Szakal asked the VCAT members to identify not only the next CET they would like to focus on but, also any other topics they would like to discuss at the February meeting.

**Discussion.** The group discussed the following topics:

- Missed workforce particularly attracting, retaining, and developing,
- Successes and challenges pertaining to workforce, and
- Interagency and how NIST is working with other agencies.

### **Meeting Wrap-up**

There were no public comments. In closing for the day, Dr. Jackson and Dr. Locascio thanked all the participants, invited guest speakers, and NIST staff.

### **Adjournment**

The meeting was adjourned at 5:07 PM.

I hereby certify that to the best of my knowledge; the forgoing minutes are accurate and complete.

Ms. Stephanie Shaw, Designated Federal Officer, NIST Visiting Committee on Advanced Technology  
Dr. Mehmood Khan, Chair, NIST Visiting Committee on Advanced Technology