

**VISITING COMMITTEE ON ADVANCED TECHNOLOGY (VCAT or Committee)  
MINUTES OF THE TUESDAY, JUNE 14, 2022 AND WEDNESDAY, JUNE 15, 2022  
WEBINAR MEETING**

**ATTENDANCE: \*in person**

**Visiting Committee**

**Members Attending**

Cerf, Vinton\*  
Fischer, George\*  
Jackson, Keoki\*  
Johnson, Anthony M.  
Kaler, Eric  
Khan, Mehmood\*  
Ku, Katharine\*  
Parker, Michelle  
Vasko, David (Dave)\*  
Wasserman, Gail

**Designated Federal Officer**

Shaw, Stephanie\*

**NIST Leadership Board**

Bahar, Mojdeh\*  
Boehm, Jason\*  
Brockett, Del\*  
Brown, Essex  
Chin, Joannie\*  
Dimeo, Robert (Rob)\*  
Dowell, Marla\*  
Fangmeyer, Robert\*  
Hooker, Stephanie  
Jenkins, George E.  
Kushmerick, James\*  
Lin, Eric  
Mackey, Elizabeth (Liz)  
Molnar, Mike\*  
Olthoff, James K.\*  
Raghavan, Pravina\*  
Romine, Charles (Chuck)\*  
Sastry, Chandan  
Vaughn, Robert (Skip)  
Wixon, Henry\*

**NIST Staff**

Adams, James  
Andrews, Anne  
Averill, Jason  
Babakhanova, Greta  
Barbosa, Nicholas  
Barrett, Claire  
Bell, Glenn  
Boeckl, Kaitlin (Katie)  
Brown, Hannah\*

Cancino, Janet  
Chang, Walter  
Chaudhry, Nikhil\*  
Chukran, Melinda  
Claussen, Monica  
Corwin, Kristan  
David, Lindra  
Dohne, Kirk  
Donley, Elizabeth  
Elwany, Alaa  
Evans, Heather\*  
Fasolka, Mike\*  
Fato, Hope\*  
Fetsko, Melissa  
FitzPatrick, Gerald  
Folk, Alex  
Forster, Amanda  
Fung, Juan  
Gayle, Frank  
Gillerman, Gordon  
Glenn, Rachel  
Gloster, Gerald (Jerry)  
Goldstein, Barbara  
Gonzalez, Carlos  
Greer, Chris  
Griffith, David  
Gundlach, David  
Hanna, Nancy  
Healy, William (Bill)  
Hickernell, Robert (Bob)  
Hight Walker, Angela  
Hildebrand, Jacqueline  
Holbrook, Dave  
Hooker, Stephanie  
Huergo, Jennifer  
Ivester, Rob  
Ivy, Nahla  
Jahanmir, Said  
Jones, Christina  
Kauffman, Leah  
Kelsey, Richard  
Keys, Mirta-Marie  
Kim, Yekyung  
Kirby, Brian  
Kramar, John  
LaSalle, Connie  
Liddle, James  
Lin-Gibson, Sheng  
Lyford, Chancy  
Madsen, Mark  
Mahn, Amy  
Marshall, Jennifer  
Materese, Robin

Mattson, Bruce  
Mayton, Heather  
McIntyre, Kevin  
Meritis, Dimitrios\*  
Merkel, Warren  
Midzor, Melissa  
Mitrani-Reiser, Judith  
Neumann, Dan  
Newton, Thomas  
Ng, Lisa  
Orji, Ndubuisi (George)  
Pacelli, Mary Ann  
Parkhurst, Emily  
Pascoe, Cherilyn  
Pollack, Charles  
Porch, Susanne  
Pritchett, Jeanita  
Ramotowski, Robert  
Ray, Clifton  
Reidy, Kari  
Rippard, William  
Rogers, Kelley  
Rudnitsky, Robert  
Saundry, Claire  
Sberegava, Anna  
Schlatter, Katie M.  
Schmit, Mark  
Schufreider, Jim  
Scott, Craig  
Seiler, David (Dave)  
Sharpless, Kathy  
Shyam-Sunder, Sivaraj  
Snow, Heather  
St. Pierre, James (Jim)  
Stine, Kevin\*  
Strouse, Gregory  
Sullivan, Suzanne  
Szuchyt, April  
Tabassi, Elham  
Teske, Michael  
Ufford, Donald  
Valdez, Zachary  
Vanek, Anita  
VanLandingham, Mark  
Varadi, Laslo  
Wasil, Charles  
Wavering, Al  
Widdup, Joseph  
Wilkinson, Richard

Wilson, Andrew  
Yao, Jue  
Yashar, David

**Others**

Cassady, Lewis-Burke  
Associates LLC  
Jillavenkatesa, Ajit – Apple Inc.  
Lucas, Jeff – SynBio Coalition  
Melpakkam, Matangi – Science  
Policy News American  
Institute of Physics  
McQuinn, Alan – Professional  
Staff - Research and  
Technology Subcommittee  
Committee on Science,  
Space, and Technology

Tuesday, June 14, 2022

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

Dr. Khan called the meeting to order at 10:00 a.m. and reviewed the meeting logistics. Prior to turning over the meeting to Dr. Locascio he congratulated her on her appointment as the new Director of NIST and Under Secretary of Commerce for Standards and Technology.

## SESSION I: NIST PROGRAMMATIC UPDATE

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

Dr. Locascio acknowledged and thanked Dr. Khan as the new VCAT chair and Dr. Keoki Jackson as the new Vice Chair, and she then gave an overview of the meeting agenda. Next, she reviewed changes in leadership at NIST and gave an overview of NIST's programs.

**Leadership changes.** Dr. Sessa Joi Moon, the first director of the Office of Diversity, Equity, and Inclusion, will be leaving NIST for a new position as Chief Diversity Officer for House Speaker Nancy Pelosi. Dr. James Olthoff will return to his role as Associate Director for Laboratory Programs (ADLP), and Dr. Eric Lin will be moving back to his role as Director of the Material Measurement Laboratory (MML). She thanked Dr. Stephanie Hooker and Dr. Mike Fasolka for stepping up while Dr. Olthoff and Dr. Lin were fulfilling other duties. Pending OPM (Office of Personnel Management) approval, Dr. Jason Boehm will be the Chief of Staff of NIST.

#### **Highlights of NIST Programs.**

**Advanced Communications Update.** Fifth generation (5G) cellular systems will enable powerful new technologies like artificial intelligence (AI) and massive device-to-device communications. These emerging technologies will help the American economy, but with new vulnerabilities or opportunities for vulnerabilities, including with respect to the system hardware. NIST is addressing these issues in partnership with industry by developing recommendations on implementing a measurement-based hardware security strategy, and published a special report, "5G Hardware Supply Chain Security Through Physical measurements."

NIST staff have demonstrated how Rydberg atoms can function as receivers for electromagnetic waves and could be used to make small and versatile communications devices that don't rely on antennas or electronics, which opens a new frontier in wireless communications with vast potential in detecting high bandwidth signals. NIST staff have progressed from simple demos to streaming live color video and video games with this system.

The Resilient and Intelligent NextG Systems (RINGS) awards bring together NIST, the National Science Foundation (NSF), the Department of Defense (DoD), and industry partners to accelerate research on wireless and mobile communication networks, associated computing systems, and large-scale services through grants, and NIST's extensive resources and expertise, and 25 awardees in public-private partnerships were announced in April.

**Artificial Intelligence Update.** Development of the AI Risk Management Framework is ongoing. The first draft was released in March, and NIST received substantial comments from stakeholders, which NIST is currently analyzing to support release of the next draft. NIST's current approach to AI bias focuses on statistical and computational bias, but systematic and human cognitive bias also affect the design, development, and deployment of AI systems. NIST released Special Publication 1270 in March, which advances work toward a standard for identifying and managing bias in AI by using a sociotechnical approach to bias management.

On April 27th, NIST cohosted a symposium on responsible and inclusive AI, co-led by Ms. Elham Tabassi, and on May 4th, the President's National AI Advisory Committee (NAIAC), which was established to advise the President and other Federal agencies on issues related to AI, met for the first time; Secretary Raimondo kicked off the meeting. NIST staffs this high-level committee on behalf of the Department of Commerce (DoC).

*Cybersecurity Update.* NIST launched a Request for Information (RFI) to evaluate and improve NIST cybersecurity resources with a goal to seek input on a potential update to the NIST Cybersecurity Framework (CSF) and how to improve the security of supply chain resources; the RFI was closed on April 25. The update to the existing framework will be called CSF 2.0 and stems from last summer's White House summit of technology supply chain security. Executive Order (EO) 14028, "Improving the Nation's Cybersecurity," which was prompted by the massive SolarWinds attack in 2020, was released in May 2021 and contained a lot of call outs for NIST. NIST has met all of its obligations under the EO and has delivered the final reports.

*Quantum Information Sciences Update.* A new presidential directive of National Security Memorandum 10 (NSM-10) lays the groundwork for continued American leadership in quantum science and technology while mitigating the risks to national and economic security. It directs NIST to establish a migration to a post-quantum cryptography project. The directive calls for an open working group with industry to generate research on quantum-resilient cryptographic standards and technologies, and NIST several years ago started a project to solicit, evaluate, and standardize quantum-resistance public key algorithms, and NIST hopes to make announcement on that soon.

The Quantum Economic Development Consortium continues to make progress to enable a robust commercial quantum-based industry and associated supply chain across the United States. Two new reports have been released, the Quantum Computing Industry Study and the Control Electronics Report.

NIST physicists, led by Dr. Jun Ye, have developed a new way to control two-dimensional gaseous layers of molecules, published in *Science*, which could lead to new ways to explore molecular interactions in quantum systems.

*CHIPS Act Update.* Though CHIPS (Creating Helpful Incentives to Produce Semiconductors) was authorized in the NDAA (National Defense Authorization Act) of 2021, the funds have not yet been appropriated and the bill is being conferenced as the Bipartisan Innovation Act, a combination of United States Innovation and Competition Act (USICA) and America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act. NIST was instructed in the authorizing bill to form the Industrial Advisory Committee (IAC) and member selections are awaiting final selection by the Secretary. DoC and NIST received over 200 unique responses to a CHIPS Act RFI (Request for Information) issued earlier this year, and a report will be issued once the review is complete. DoC has appointed a Special Advisor to help set up the CHIPS Act program office within DoC, and NIST and DoC staff are planning for quick implementation of the CHIPS Act if it's implemented.

*Manufacturing Update: Labs.* Executive Order 13987 on combatting COVID-19 and future pandemic threats was released January 2021. The goal was for the federal government to act quickly and aggressively to combat COVID-19. An example of the work in this space is the development of action plans related to indoor air quality, ventilation standards, and technology innovation for pathogen suppression in the built environment. In May 2022, President Biden announced Additive Manufacturing (AM) Forward, a collaboration with four large manufacturers. The intent is to promote adoption and use of additive manufacturing to help lower costs, increase competitiveness and high-paying jobs, and improve supply chain resilience. NIST also plays leading roles in standards development with ASTM, ISO, ASME and other standards bodies, and this supports the manufacturing sector.

*Manufacturing Update: MEP.* In FY21, the Manufacturing Extension Partnership (MEP) supported over 34,000 U.S. manufacturers and was responsible for \$14.4 billion in new and retained sales as well as over 125,000 new jobs. Dr. Locascio said NIST is really "boots on the ground" in all 50 states and Puerto Rico to bolster manufacturers, and U.S. Representatives and Senators in every state support the program.

*Manufacturing Update: Manufacturing USA.* NIST runs a network of 16 manufacturing institutes but only funds one, the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL). This spring, NIST awarded nearly \$3.5 billion to 13 organizations to lead road mapping efforts via the MfgTech funding opportunity. NIST announced in February \$54 million in Pandemic Response Awards to eight different Manufacturing USA institutes. NIIMBL played an important role during the pandemic and is one of three biomanufacturing institutes in the network. NIST announced 32 Pandemic Response projects, including projects to address improved methods for vaccine production and distribution.

*Bioeconomy Update.* The administration will soon be releasing a report setting goals and priorities to promote a thriving U.S. bioeconomy. NIST recently established the NIST Microbial Strain Collection (NMSC) program and is developing a new Standards for Wastewater Surveillance (SWWS) program in this activity, which involves collaboration with the EPA, CDC, and DHS.

*National Standards Strategy and DoC Action Plan.* NIST had extensive input in the development of the National Standards Strategy for Critical and Emerging Technologies by the National Security Council, which is soon to be released. This strategy outlines key actions to ensure U.S. leadership in standards development as well as strengthening the U.S. government participation in international standards development. NIST is leading coordination efforts across DoC in preparation for its release.

*Standards Update: International Engagement.* NIST sent a delegation to Brussels to participate with ITA (the International Trade Administration) in a working group in advance of the U.S.-EU Trade and Technology Council (TTC). Two key announcements made at the U.S.-EU TTC ministerial in May were cooperation around international standards and a partnership on Trustworthy AI. NIST is also engaged in standards development strategies with the Quad (U.S., Australia, India, and Japan), the Ottawa 5, the Organization for Economic Co-operation and Development (OECD), and the Into-Pacific Economic Framework (IPEF).

*DEIA Update.* The DoC Equity Plan was released in April and includes Department-wide efforts to advance the inclusive economy through equitable external service delivery. The NIST Diversity, Equity, Inclusion, and Accessibility (DEIA) Strategic Plan is in preparation to deploy the beginning of fiscal year 2023.

Dr. Locascio concluded by emphasizing the NIST Mission to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life.

More detail on these and other highlights can be found in Dr. Locascio's [presentation](#).

**Discussion.** VCAT members discussed the following topics:

- Lessons learned from NIIMBL funding that others can use,
- Information sharing to VCAT members of Rydberg atom work,
- Implementation of high-density semiconductor chip manufacturing capability within NIST,
- Jeanita Pritchett will be acting DEIA Director until a competitive selection process is finalized, and
- Technology maturation and transfer, such as the time an invention like the Rydberg atom takes to get in the hands of industry, and better “telling the story” of government research that supports industry.

### **Reentry and Safety Update - Dr. Elizabeth Mackey, Chief Safety Officer and Director of Office of Safety, Health, and Environment (OSHE)**

Dr. Mackey said NIST's focus on COVID has been keeping current with the changes in science. The Centers for Disease Control and Prevention (CDC) changed their protocol and recommendations, and DoC and NIST has aligned with them as follows:

- Daily health screening,
- Support for mask use and social distancing (although required only at high community levels), and
- Proper Hygiene.

A COVID screening testing program for campus access was launched May 2022 to meet the Office of Management and Budget (OMB) requirements during medium and high community levels. If not fully vaccinated, employees, associates, visitors, and contractors are required to participate in the COVID screening testing once or twice a week when coming to the NIST campuses, this impacts only a small fraction of staff because of high vaccination rates. Town halls, all-staff emails, NIST directives, guidance documents, websites, FAQs, and all the normal venues are utilized as communication modes.

On NIST COVID case management and data, as of June 6, case rates are going up. NIST requires that staff report if they experience COVID symptoms, positive tests or have close contacts to their supervisors so telework arrangements can be made. Supervisors are required to report cases and close contacts to the email

[covid19@nist.gov](mailto:covid19@nist.gov) without names. If someone on campus is potentially infectious to others, their space will be closed for about 24 hours or require disinfection immediately if the space needs to stay in use.

Workplace inspections have a stronger restart this year. As of June 25, all staff are required to work onsite per their telework agreements. Offices will be inspected once per year, and spaces covered by hazard reviews, such as laboratories, will be inspected once or twice per year. NIST has launched a series of workplace inspector courses, refresher courses for people who perform the inspections, and we have topical reminders, short courses, and a communication campaign that includes emails. Data from October 1 to March 31, Quarters 1 and 2, on the workplace inspection restart for FY22 is in for 25 percent of laboratory inspections and 15 percent of the office inspections compared to FY19.

NIST had a pretty good campaign to update occupant information on doors. The most frequent hazards found during inspections during Q1 and Q2 of FY22 are chemical labeling, especially when materials come in from manufacturers that need to be properly labeled. Housekeeping is always a challenge. So far in FY22, there have been 914 deficiencies found, and 639 have been cleared. Stale deficiencies (long duration without resolution) are a problem, so we are involving the Executive Safety Committee, laboratory directors, and OU directors. Sometimes managers changes or fixes have happened but were not closed out in the system, so we are working to close those stale deficiencies.

The data for incidents and near misses is difficult because of reduced staffing on campus. To date, there have been 52 incidents, and 16 of those were injuries, 12 illnesses, and 12 near misses, with 5 property damage, 2 radioactivity contamination events, 1 spill, and 2 exposures. The reduced reporting, however, reflects reduced staffing on campus. The injuries reported to date include:

- Employee strains back while lifting pipe,
- Employee suffers fractured foot in fall on uneven ground,
- Employee injured in encounter with campus geese,
- Employee injured by elevator door, which occurred off-campus at CU in JILA and triggered deeper look at facilities there
- Employee cut using knife to open box, and
- Laceration to three fingers while cutting hose.

The illnesses to date (10 recordable ones) are:

- Seven COVID workplace transmission cases (reporting required by OSHA),
- Employee experiencing neck and back pain teleworking,
- Employee has heat rash/allergic reaction, and
- Employee experiences occupational hearing loss.

Communications with an Occupational Safety and Health Administration personnel resulted in good outreach. A focus called (SR)2 series (Safety Reminders for a Safe Return) has been getting good reviews.

OSHE is very engaged in ensuring actions within the NIST Center for Neutron Research (NCNR) are taken to prevent anything similar from happening in the future, and in ensuring that lessons learned from NCNR are implemented, where appropriate, across the entire organization. After the February 2021 incident, the OSHE Radiation Safety Division provided support by way of equipment to provide range and spectroscopy capabilities needed to look at isotopes. NIST is past response and recovery and moving to the next phase. The NCNR director shared lessons learned with the Executive Safety Committee. Emphasis will be put on a safety culture program on a regular basis, to include traits specific to the nuclear environment. Two new safety programs will be informed by NCNR lessons learned: the Change Management Program; and the Monitoring, Measuring, and Assessments Program.

Dr. Mackey serves as vice chair of the Safety Evaluation Committee (SEC) for the TR-5 license. In this role she is focused on strengthening oversight, ensuring independence, and covering industrial safety impacts. Working toward better integration of NIST safety within NCNR is needed, and Dr. Locascio will be an ex officio member of the NCNR Safety Evaluation Committee. An OSHE Safety Specialist is now embedded at NCNR to support regular safety and see how regular safety interacts with radiation safety. Also formalizing collaboration and mutual assistance between OSHE's Radiation Safety Division and NCNR Health Physics.

Identifying change, evaluating, and mitigating risk is the last step needed to inform an enterprise-wide risk management at NIST. This is aligned with ISO 45001 and is informed by ISO 31000, the Risk Management Guidance document. Change types include regulatory changes, organizational changes, workforce changes as well as changes in facility and work environment, work processes, and down to equipment and materials. NIST leverages existing change management processes for this, but also is identifying gaps.

The focus now is to return to campus, i.e., the “Transition to Hybrid.” A communication plan with is in place, with constant reminders for resuming workplace inspections to full capacity. There is a focus on indoor air quality assessments. There are facilities challenges (e.g., floods, unoccupied spaces). NIST will continue to maintain COVID safety protocols and manage cases in a way that's respectful to staff.

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

**Discussion.** VCAT members discussed the following topics:

- External-facing protocols needed for visitors to NIST, and
- How NIST compares to other government agencies on safety practices and processes.

### **[NIST Center for Neutron Research Update - Dr. James Olthoff, Associate Director for Laboratory Programs, NIST; and Dr. Robert Dimeo, Director, NIST Center for Neutron Research](#)**

Dr. Olthoff highlighted the immediate actions taken in regard to the NCNR incident on February 3rd. An Incident Response Team was convened to provide institutional support, where there was an enormous amount of communication with stakeholders. He thanked the Public Affairs Office (PAO) for the excellent work with respect to communicating with DoC and the community. In addition to the \$10 million used from NIST funds to respond to the event immediately, funding has been provided in the 2022 budget to cover expenses to recover and resume safe operations.

An external review panel consisting of subject-matter experts (SMEs) reviewed how NIST responded to the incident and provided an independent review and individual recommendations. The SMEs were:

- Dr. Julie Phillips, Vice President and CTO (retired), Sandia National Laboratory,
- Dr. Eric Kaler, President, Case Western Reserve University,
- Dr. Thom Mason, Director, Los Alamos National Laboratory, and
- Alexander Adams Jr., Chief, (retired) U.S. Nuclear Regulatory Commission Research and Test Reactors Licensing Branch.

NIST concurred with the findings and recommendations of the SMEs and is working to implement both short-term corrective actions and long-term operational changes.

Dr. Dimeo reminded the VCAT there are only two sites in U.S. that have major neutron programs, Oak Ridge National Laboratory and NCNR. NIST accounts for about 40 percent of the U.S. scientific productivity. He also reminded the VCAT that the February 3rd incident happened on the same date as the last VCAT meeting, but when the reactor was restarted, it automatically shut down, resulting in no health or safety impacts to staff, public, or the environment and posed no risk to personnel and community. The direct cause was a fuel element that was unlatched at startup and did not receive sufficient cooling and overheated.

The NRC (Nuclear Regulatory Commission) completed their inspection March 16th resulting in the release of the Special Inspection Report. They described seven apparent violations, five of which NIST had already identified through disclosure in its investigation process. An alternate dispute resolution occurred for the so-called “enforcement” part of the process, and a final confirmation order including requirements and enforcement actions will be issued to NIST, which becomes part of the TR-5, the reactor operations license.

Root causes were determined, and correction actions identified. Funds for corrective actions were secured in FY22, and significant progress has been made. The primary coolant system cleanup continues, but the fuel inspection is complete; most fuel elements are not reusable because of debris on them. An alternate startup

core concept analysis is underway; this will use a combination of old fuel elements on site that weren't in the reactor, and fresh fuel elements. Two scientific community briefings have taken place since the last VCAT meeting.

NIST needs to complete restoring of the reactor to operational readiness, which includes cleanup of the primary coolant system and determining the feasibility of the startup core. After NRC issues a confirmatory order, NIST will begin implementation of enforcement actions. The next step will be NRC issuing a decision on NIST's request to restart the reactor, involving increased oversight and inspections. Then user experiments can be scheduled.

Restarting the reactor has two components: technical readiness, and the NRC authorization. The plan is to use the alternate startup core and hope it is ready by late August for low-power testing. NRC needs to verify the implementation of the enforcement actions that come out of the confirmatory order. Both have uncertainties at this time that could affect a 2022 restart, such as if cleanup of primary does not go as planned. As well, there is a possibility that one of the startup core configurations might require a license amendment for a mixed core, including doing visual checks of the core. This would cause a delay while developing the appropriate documentation. COVID continues to be a risk that could also lead to delay.

The fuel damage of the February 3rd incident was unprecedented in research reactor history. NIST is committed to ensuring that a fuel damage incident like this never happens again. NIST's corrective actions and program improvements are broad and comprehensive and minimize the probability that an event with the potential to impact public health and safety occurs. Culture was a factor in multiple root causes of the accident, so focus will continue to be on a healthy nuclear safety culture. Operations will have continuous improvement in multiple ways, and benchmarking is one of them, as well as monitoring and assessment, education, and frequent communications.

A few of the developments relevant to safety culture improvement include:

- Initial NSCIP (Nuclear Safety Culture Improvement Program) plan draft completion,
- Baseline nuclear safety culture assessment completion by OSHE,
- Benchmarking underway,
- Implementation of new NCNR safety recognition program,
- Strengthened safety communications, and
- Leadership safety training.

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

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

- Resources available outside of NIST to enable reactor return to service,
- Managing change of personnel, in addition to tools, equipment, and procedures, to ensure safety,
- Incorporating an additional reactor operations' shift solely devoted to training,
- Addressing safety culture in other NIST departments and laboratories, and
- Configuration of the core elements and corrective actions in place to improve incident response time.

### **[Surfside Investigation Update – Mr. Glenn Bell, Associate Lead Investigator, Champlain Towers South, NCST Investigation, and Research Civil Engineer, NIST Engineering Laboratory](#)**

Mr. Bell stated he arrived at the collapse site last summer and described his visit to the Wall of Hope and Memorial as a moving experience. He and his team are always reminded that 98 people perished in this collapse.

Mr. Bell briefed VCAT members on some of the technical aspects of that investigation since the October 2021 VCAT's meeting when Dr. Judith Mitrani-Reiser presented the investigative work at the collapse site. The NCST Act (National Construction Safety Team Act) requires the report to address the technical cause (or causes) of the failure and to make recommendations. The mission is not to find fault but rather determine why the failure occurred. The implementation phase of investigations will be critical to the mission of averting future disasters.



Under the NCST Act, NIST was tasked with developing three forms of recommendations; one related to establishment of evacuation and emergency response procedures, another focused on appropriate standards, modes, and practices, and finally those associated with research and other actions to prevent future building failures. The NIST role is to craft recommendations but, NIST is not authorized to require adoption of code standards or practices, as NIST is not a regulatory agency.

This has been one of the most difficult and complex investigations of its type ever undertaken, because no clear initiating event has been identified even a year after the collapse. The approach taken by NIST is to develop a failure hypothesis, which is an investigative supposition about where and how the failure occurred with likely contributing causes. The process throughout the investigation is to prove or disprove individual hypotheses by collecting evidence, analyzing the evidence, and then conducting tests and simulations. Mr. Bell stated that there may be several contributing factors to the collapse.

To examine the failure hypotheses, there are two general investigative paths: progressive collapse analysis, and collapse evidence analysis. The two paths complement and aid each other. At the end of the investigation, the two analyses should agree with each other.

The NCST has organized six multidisciplinary investigative teams that include subject matter experts from different disciplines within and outside of NIST. These teams work together in a well-integrated manner:

- The Evidence Collection and Preservation Project team and the Remote Sensing, Data, and Visualization team provide the primary inputs for the collapse evidence analysis. These two teams provide information to the other four teams: Building and Code History; Materials Science; Geotechnical Engineering; and, Structural Engineering, which inform and conduct the progressive collapse analysis.
- The Building and Code History project team's work includes studying documents from the original design and construction of Champlain Towers South. They also study the records of changes made to the building and the effects of loading and changes in environmental conditions or the impact of adjacent construction from a building immediately south of the Towers. This team works with other teams in examining the parts of the structure retrieved from the Champlain Towers South site during the search and rescue and recovery phases, to determine the extent to which the actual construction conformed with the design requirements.
- The Geotechnical Engineering team studies everything below the ground: the soil, the rock, the groundwater, tidal actions, and performance of the foundations. This team performed an extensive subsurface investigation which involved drilling 70 test borings into the ground to retrieve samples for laboratory testing. By using extensive nondestructive techniques, the team was able to preserve existing site evidence.
- The Materials Science team established composition and condition, mechanical properties, durability, and the extent to which they conform with the original construction requirements, as well as what aging, and deterioration mechanisms may have occurred over the structure's life.
- The Structural Engineering team's primary tasks involve computer modeling and laboratory testing to conduct the progressive collapse analysis, in collaboration with the Geotechnical Engineering team. They use a state-of-the-art software called ETABS (Extended 3D Analysis of Building System) to evaluate the original structural design and examine points of vulnerability.

Various forms of advanced remote sensing and data visualization are conducted by NIST using drone flights. Advanced forensic imaging provides information on the mechanics of the collapse sequence. Interferometric synthetic aperture radar images provide data on historical movements of the site and structure. A 3-D geospatial model of the building serves the entire team as a repository for all types of investigative data, searchable by location or by a particular component of the structure.

The recommendations part of NIST's report will be key to ensuring lessons learned and corrective action is taken to ensure a disaster like Champlain Towers South collapse never happens again. There are enormous implications for the life safety of buildings across the United States and elsewhere in the world.

For FY22 and FY23, Congress provided \$22 million in supplemental funding. Technical work is expected to be complete by end of FY23, and the report is expected to be complete by end of FY24.

For more information, see Mr. Glenn's [presentation](#).

### **Budget Overview - Dr. Jason Boehm, Director, NIST Program Coordination Office**

The total FY22 budget was \$1.23 billion for NIST. MEP and some laboratory research areas received a small increase, while funding for Construction of Research Facilities and Manufacturing USA were flat. A new factor in this budget was Congress bringing back earmarks for the first time in 10 years, which added \$163 million to the topline budget; NIST was directed to award these funds to specific entities external to NIST.

The topline appropriation number for NIST at \$1.23 billion was broken out to different accounts:

- Scientific and Technical Research Services (STRS), laboratory programs,
- Industrial and Technical Services (ITS), MEP and Manufacturing USA, and
- Construction of research facilities.

In FY22, NIST received \$24 million in discretionary funds in the STRS program; much of this was identified by Congress for specific laboratory projects. Quite a bit of the \$24 million went towards cybersecurity, but a significant focus was on the NCNR project. About \$15 million has been realigned, reprogrammed, and redirected to NCNR.

Currently, the President's Budget Request for FY23 is being reviewed by Congress. If the President's budget were to pass, NIST would receive a significant increase, \$400.7 million, about a 37.6 percent increase over the amount in the FY22 enacted budget. The President's FY23 budget request retains many of the NIST priorities from the President's FY22 request:

- It includes a major investment in critical and emerging technologies -- an increase of roughly \$80 million to address technology areas such as Quantum Information Science, Artificial Intelligence, Bioeconomy, and Advanced Communications.
- The President's FY23 budget will provide more investment for MEP and Manufacturing USA to align with the President's priority to strengthen U.S. manufacturing. The \$124.2 million for the MEP program brings the total program up to about \$275 million to enable MEP to focus on three main areas: workforce, supply chain work, and technology deployment.
- NIST has roughly a \$40 million increase for construction of research facilities in the President's FY23 budget, focused on maintenance and major repair. This would bring NIST's total investment to \$120 million.

There are ongoing discussions in Congress with the bill, and NIST provides technical drafting assistance and answers questions.

Dr. Boehm provided a comparison of how NIST and other science agencies have fared historically. In 2006 and 2007, the Bush administration proposed to double funding for key physical science agencies, with an emphasis on supporting the "core" which they defined as our construction of research facilities and our STRS funding. This was translated into authorization language that was largely followed by appropriations to nearly double NIST's budget over a 10-year period. In recent years, the increase has been more gradual, with many swings due to large amounts of construction funding. He showed comparisons to other federal government entities, such as NSF, the Department of Energy Office of Science, the National Aeronautics and Space Administration, and the National Oceanic and Atmospheric Administration.

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

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

- Bump in NSF budget for FY23 for new Technology, Innovation, and Partnerships directorate,

- Concern over infrastructure investment, repair, and maintenance, and how to inform Congress of what happens without improvements to NIST's posture, and
- Earmark implications in FY23 budget and NIST operations.

## SESSION II: NIST DIRECTOR VISION

### NIST's Efforts to Support America's Competitiveness in the Global Economy - Dr. Laurie Locascio, Under Secretary of Commerce for Standards and Technology and NIST Director

Dr. Locascio stated that she participated in the development of the Council on Competitiveness "Competing in the Next Economy" report, which illustrates the need to support American competitiveness. Internationally, China is not slowing down on investment in gross domestic expenditures on R&D and are on an aggressive trajectory. Science and Technology is a clear priority for China.

In light of these dynamics, Dr. Locascio recently met with the NIST Executive Board to identify priorities for the next few years, considering NIST's strengths, national priorities and queries from Congress and the White House. From these early discussions, Dr. Locascio shared five new priorities that she plans to focus on:

1. *Critical and emerging technologies leadership.* NIST is essential in the development, manufacture, and adoption of technologies critical today and those yet to be imagined. There are six critical and emerging technologies: biotechnology and engineering biology to impact health, agricultural, and industrial sectors; artificial intelligence to be trustworthy, transparent, and machine learning; cybersecurity and privacy to enable the development and deployment of emerging technologies; energy technologies, generation, storage, and distribution of secure, climate-friendly, efficient utilization of energy; advanced communications, 5G and beyond and wireless technologies; and quantum information science, leveraging quantum mechanics for storage, transmission, manipulation, computing, or measurement of information. There are clear motivations behind this priority. It is a clear national need to promote and quicken the development of emerging technologies in light of the global competition landscape. A challenge ahead for the U.S. is to have an innovation ecosystem that is market-driven and bottom-up. The opportunities are that NIST is a strong collaborator and has the trust of industry, academia, and government and works across the continuum from basic to applied research to manufacturing to standards. NIST has led programs that have driven new industries throughout history, including most recently in quantum.
2. *Standards leadership.* NIST's vision is to lead the execution of the U.S. Government's National Standards Strategy for Critical and Emerging Technology and the development of Federal standards policy to ensure continued U.S. global economic competitiveness and technology leadership. There are several motivations for this: it is a national security and an economic security priority for this Administration and Congress, and new strategies have recently been released by both China and the European Union (EU). A few years ago, China released the China Standards 2035, which indicates they want their industries to set global gold standards leading to market dominance. It is essential that the United States remains fully engaged in international standards development. The EU has released its own standards policy and strategy in response to China. A challenge is to balance public-sector and private-sector concerns when it comes to national security concerns and international standards. There are new proactive allies and new fora in the international scene aimed at addressing international standards.
3. *Manufacturing Leadership.* NIST is industry's one-stop shop for practical tools, services, and measurement expertise to accelerate U.S. competitiveness and impact. If the Bipartisan Innovation Act is funded, it will position DoC to successfully execute CHIPS Act programs. It is an administration and congressional priority to solve the semiconductor supply chain issue. The U.S. produces just a fraction of the semiconductor chips that it uses annually and has no capacity to manufacture the most advanced chips. Some of the challenges are that it is a complex program that is going to swamp the NIST budget, but it is high visibility, with multiple pieces. It has incentives for industry and about \$12 billion in research, so it's a big deal. Quick wins are needed. It is a clear priority for DoC. A second

priority under manufacturing is the alignment of NIST programs across its directorates. It is an administration and congressional priority to bring manufacturing back home and to solve supply chain issues. NIST has incredible intramural and extramural programs, but they have been largely siloed and not coordinated. NIST has partnered with manufacturers and must accelerate the transition from R&D to manufacturing, deliver laboratory outputs to the factory floor, and make NIST resources as accessible as possible to industry.

4. *Mission delivery enhancement.* NIST engages with Congress, key policymakers, and the public to ensure support and adequate funding for NIST's impactful mission in economic competitiveness. NIST wants to be fully resourced for the big mission at a time when global competitiveness is a priority, but challenges are flat funding and failing infrastructure/decaying buildings. The challenges are the motivation, which is the opportunity.
5. *NIST community building.* NIST must be open to change, a community where everyone is valued, supported, engaged, and empowered. It is a shared goal for NIST to be the best place to work. Challenges being addressed now are issues in diversity, equity, inclusion, and accessibility (DEIA), the NCNR situation, and bringing people back to campus post-COVID. NIST has a chance to restart and become the exemplar of a safe, healthy, and respectful work environment.

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

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

- For manufacturing to be competitive, NIST must connect and manage its organizational silos,
- Manufacturing USA program could connect the big divide between manufacturing and research,
- NIST could play a role in bridging the gap through Manufacturing USA and MEP,
- Role of Manufacturing USA is for a whole-of-government effort to partner with industry and academia,
- Opportunity to expand Small Business Innovation Research (SBIR) program through funding of specific entrepreneurial ideas,
- Solving the supply chain issue at the very basic level to start manufacturing,
- DoC to secure funding for new critical supply chain resilience program to assess gaps and challenges,
- Onshore production capability for rare metals and other components,
- How to overcome stovepipes in intramural and extramural activities around manufacturing, and
- Growing participation in the laboratories would be beneficial to institutes as well as NIST internal programs.

## **SESSION III: PLANNING SESSION**

### **Discuss VCAT Focus for Year Ahead - Dr. Jason Boehm, Director, NIST Program Coordination Office**

Dr. Boehm said that the goal of this session is to map out a path and obtain a list of possible topics and actions that VCAT should focus on over the coming year. NIST leadership have three topics to be discussed in detail: advancing NIST's mission and improving visibility and awareness of NIST; NIST's role in workforce development; and alignment of NIST laboratories, MEP, and Manufacturing USA.

#### **Part I: Advancing NIST's Mission and Improving Visibility and Awareness of NIST**

An end goal for Part I is to formulate a productive way for NIST to engage with Congress, key policymakers, and the public to ensure support and adequate funding for NIST's impactful mission in economic competitiveness. To improve visibility, public outreach and engagement can support NIST's mission and staff through original articles about NIST's research and internal news for NIST staff. Congressional and legislative affairs is another key component of outreach and stakeholder engagement, and this effort should coordinate and advise congressional legislation via a liaison between NIST and congressional committees that handles correspondence, inquiries, and provides NIST staff with the status on pending legislation. In the laboratories, the programs sometimes have their own communications experts as well as engagement with stakeholder networks and other approaches at an individual unit level.

Challenges include those key stakeholders in the DoC, Congress, and other groups are not uniformly well-informed about NIST and the value it has to economic competitiveness, beyond well-known efforts such as MEP and cybersecurity.

Possible solutions to improve visibility and awareness of NIST are to better understand the holistic stakeholder environment, develop a plan to vastly increase engagement with stakeholders, and ensure has the required staff needed. Positioning NIST staff in key locations with strategic deployments can help accomplish this goal, as would ensuring NIST has a good communication piece/pitch that captures what makes NIST unique. To help engagement, it is essential to have the resources aligned with public affairs and congressional and legislative affairs to deliver on these new challenges and issues in the organization.

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

- Get decision-makers to Gaithersburg and Boulder campus to see totality and economic impact of what NIST does,
- Implement a coordinated communication plan,
- Explain why measurement science is important, as it is the foundational element that enables a lot of other scientific breakthroughs,
- Hire interns at campuses to enable them to gain the experience of NIST,
- Consistent social media campaigns illustrating different elements of NIST,
- Define who are the stakeholders NIST is marketing to and what paths should be taken,
- Educate the public about what NIST stands for and what it does,
- Develop visual similar to the old "Intel Inside" computer stickers as a tactical way to tell NIST's story,
- Unify the NIST brand with a logo to give it brand-name recognition,
- Looking at where NIST can grow and increase in both scale and impact in other fast-growing hubs, and
- See and define where multiple future technologies are going to converge.

## Part II: NIST's Role in Workforce Development

The end goal is to get NIST better aligned with DoC and administration priorities to create a more equitable employee engagement experience and promote DEIA as well as build sustainable, employer-driven career pathways to meet employers' need for talent and to connect Americans to quality jobs. Enhancing opportunity for all Americans is a big priority for the federal government.

Dr. Boehm said that NIST does have activities focused on workforce, such as those in the Manufacturing USA, MEP, the National Initiative for Cybersecurity Education (NICE) programs, and the SURF (Summer Undergraduate Research Fellowship) program, that provide opportunities for people to learn and train in science. However, NIST has not approached workforce development corporately as a core foundation and has tended to be more internally focused on its own workforce. Challenges include difficulty in recruiting and retaining staff to work in competitive fields involving critical and emerging technologies, and the requirement for the NIST federal workforce to be U.S. citizens.

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

- NIST has embraced workforce as a core mission with efforts in competitiveness, economic growth, and manufacturing development,
- With service jobs increasing, NIST has a role in technology to increase competitiveness in service fields,
- Expose interns and postdoctoral researchers to NIST,
- Develop a pilot program targeting women who have returned to the workforce after a long-extended break,
- Attract undergraduate students to NIST to get them excited about technology,
- SURF and SHIP (Summer High School Intern Program) programs offer students opportunities to work at NIST during the summer,
- Intern program to work in clean room at NIST offers an associate's program of 2 years, often visiting tool vendors doing installs see these interns and recruit them,
- Community colleges offer technical-level training programs,

- Boulder has the Professional Research Experience Program (PREP) to attract students,
- Technical-level support in Boulder from postbaccalaureate students spending a couple years working in laboratories before graduate school,
- Increase ways for industry to do projects with NIST, such as the Center of Excellence,
- Can NIST play a role in filling the gap of those retiring and those entering the workforce,
- Is there a regional nuance to outreach, which sometimes challenges diversity,
- Hiring veterans can bring benefits to NIST, and
- Looking to high schools can bring in more diverse talent.

### **Part III: Alignment of NIST Labs, the Manufacturing Extension Partnership (MEP), and Manufacturing USA**

The end goal is for NIST's programs to be better integrated and aligned to effectively span the entire innovation continuum and effectively deliver solutions to enable industry to accelerate their competitiveness and impact. Institutes were created to bridge the gap from discovery to production and help ensure that inventions get out of the laboratories and turned into products manufactured in the U.S., instead of other countries. MEP has a program called MATTR (MEP-Assisted Technology and Technical Resource) that allows companies to come to MEP with potential challenges and find support and expertise at various NIST programs. There is a lot of engagement between NIST research and laboratory staff and the various Manufacturing USA institutes. There is a lot of close engagement across the network.

NIST is looking for ways to integrate laboratories and extramural programs and develop better connections. There is also a lack of awareness across staff and laboratories about the full continuum of what NIST has to offer, and this is an area that needs to be addressed.

Compiling an inventory of services, tools, and resources that NIST provides could provide better alignment. Development of more co-located testbeds would be supportive of industry. The CHIPS Act presents an opportunity to develop an integrated plan that aligns NIST measurement research, Manufacturing USA institutes, and the MEP community.

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

- Delivering on the CHIPS mission has execution challenges and risk and requires effective implementation,
- Replace NIST acronyms so consumers better understand what NIST does,
- Coordinated and focused planning to deliver services and value to stakeholders and customers,
- Connect with industry more to gain insights via networks to find out their needs,
- Reexamine gaps in manufacturing and ensure we're fulfilling NIST's original mission,
- Using NIST as a concierge to translate technical advice through incentives such as MATTR,
- Extramural and intramural programs used to discover solutions to industry problems,
- Future funding and ROI challenged by tension in research versus development in industry,
- Strengthen connections from Technology Readiness Levels and Manufacturing Readiness Levels scale to push and pull technology,
- Using innovation as a continuum for NIST to provide additional pathways to increase the pipeline,
- Extend funding to span all three components of NIST for pilot programs,
- NIST could compare and contrast opportunities with leaders at Fraunhofer and Helmholtz institutes, and
- Suggestion to discuss international comparisons at next VCAT meeting on where NIST and the U.S. stands.

Thoughts were shared by several attendees about setting up a subcommittee on one or all three of the topics in this session.

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

Wednesday, June 15, 2022

## SESSION IV: VCAT WORKING SESSION

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

Dr. Khan called the meeting to order and proposed for the remainder of the meeting the VCAT members to discuss three questions:

- Does NIST have all the right priorities?
- Where does the interest of individual VCAT members lie and if there is interest in subgroups?
- What is not included, that members think should be?

He suggested discussing the third question first, then the format, size, and logistics of the subgroups and finally, what can the VCAT do to assist NIST between now and the next meeting. He thought it might be beneficial for VCAT members to have one meeting during the 12-month period to be off campus, either in Boulder or another location.

### Working Session

Dr. Boehm gave a recap of the three questions and key priorities that were discussed in earlier sessions of this meeting for this working session.

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

- Explore the Grow with Google program, and the National Science Board (NSB) STEM programs for workforce development,
- Discuss possibilities of NSF's MEP and NSF's Directorate for Technology, Innovation, and Partnerships working together,
- Analyze how well cybersecurity recommendations are implemented,
- Build better tools to write software without bugs,
- After 2 years of COVID and with the arrival of new NIST Director, timing is good for developing a different level of energy at NIST for advancing the mission and visibility,
- Getting the word out about what's available at NIST for students and to aid in workforce development,
- Look for ways to improve software testing, verification, and development,
- External outreach of workforce development is needed to bring in the talent NIST needs,
- NIST cybersecurity and measurement expertise to provide metrics for how secure organizations are,
- China's growing development of their own standards puts United States at a disadvantage in the future,
- Re-platforming of software to support supply chain logistics,
- Marketplace today centering around cloud infrastructure adoption and 5G edge,
- NIST should develop partnerships with small business, manufacturing, and well-funded partners,
- VCAT to help NIST amplify the standards strategy and make that a reality,
- 6G architecture working group worthy of attention now because of mobile edge computing,
- What is NIST's role in the new economy of biology-based manufacturing,
- NIST to support a circular economy of reuse, repair, and repurpose,
- NIST workforce retention affected by delta in government and private sector salaries, growing focus on long-term research in the private sector,
- Policy on telework at NIST may not be as attractive as other places to work for same talent,
- Hybrid environment in workforce is different for some entities,
- Transition from telework to in-person presence met with resistance since pandemic,
- Jobs for all Americans and highlighting equity and inclusion elements, underserved populations,
- Defending the United States and allies in standards for the future,
- NIST protecting its cybersecurity, privacy, and critical infrastructure,
- Future technology for future industries and highlighting the outcomes,

- NIST to get more engagement at upper levels of universities and other agencies through marketing,
- Segment the market and figure out which marketing message applies by finding the right channels,
- Share Alan Alda's communication strategy and online classes for enhance marketing of NIST,
- NPR study on science communication revealed more millennials have STEM degrees than other generations,
- Millennials prefer to gather information on their own rather than hearing from star scientists,
- YouTube may be a place to advance visibility of NIST to younger generations,
- VCAT subgroup to engage industry stakeholders top advance NIST mission, visibility, and awareness,
- Rotational program between laboratories, extramural, industry, academia, and congressional staffers,
- Invite NSB Vice Chair, Victor McCrary, to brief VCAT on what's happening at NSF,
- NIST comic book of about 30 pages to show what NIST is about targeting certain audiences, and
- To be more involved in the food safety supply chain by way of training and integration.

### **Public Comment**

Mr. Jeff Lucas of SynBio Coalition asked VCAT as part of its recommendations to NIST that synthetic biology be included as part of work on advancing domestic manufacturing capacity as well as workforce development.

### **Meeting Wrap-up**

The VCAT members agreed that the discussion during this hybrid meeting was rich and successful. Dr. Locascio thanked everyone for their participation, in-person and virtually, and stressed the importance of the VCAT's input on how NIST can move forward in the years to come.

### **Adjournment**

The meeting was adjourned at 11:31 AM.

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