VISITING COMMITTEE ON ADVANCED TECHNOLOGY (VCAT)
MINUTES OF THE FEBRUARY 5-6, 2014, MEETING
GAITHERSBURG, MD

ATTENDANCE

Visiting Committee Members Attending
Chand, Sujeet*
Chowdhry, Uma
Colwell, Rita
Haymet, Tony*
Holt, William
Kerr, Karen
Padovani, Roberto*
Taub, Alan
Tracy, John

VCAT Exec. Dir.
Ehrlich, Gail

NIST Leadership Board/Designee
Boehm, Jason
Brockett, Del
Celotta, Bob
Dehmer, Joseph
Dimeo, Robert
Fangmeyer, Robert
Gallagher, Patrick
Harary, Howard
Kayser, Rich
Kelley, Michael
Kimball, Kevin
Locascio, Laurie
May, Willie
Porch, Susanne
Romine, Chuck
Royster, Cecelia
Salber, Stephen
Saunders, Mary
Singerman, Phillip

NIST Staff
Arnold, George
Arrisueno, Gladys
Averill, Jason
Banovic, Steve

NIST Staff Cont:
Beers, Kate
Bonevich, John
Cauffman, Steve
Cavanagh, Richard
Chin, Joannie
Denicola, Lawrence
Dodson, Donna
Evans, Heather
Fasolka, Michael
Foecke, Timothy
Frechette, Simon
Gayle, Frank
Gonzalez, Carlos
Hacker, Christina
Hardis, Johnathan
Henry, Akeem
Hight-Walker, Angela
Holbrook, Dave
Huergo, Jennifer
Ibberson, Richard
Ivy, Nahla
Jillavenkatesa, Ajit
Jones, Al
Jurrens, Kevin
Kemmerer, Sharon
Kilmer, Roger
Lesser, Nate
Liddle, James Alexander
Miner, Laurel
Newhouse, Bill
Porter, Gail
Satterfield, Mary
Scholl Matthew
Schufreider, Jim
Sedgewick, Adam
Seiler, David
Semerjian, Hratch
Shaw, Stephanie
Sokol, Annie
Soles, Chris

NIST Staff Cont:
St. Pierre, Jim
Stanley, Marc
Stine, Kevin
Thorne, Roger
Williams, Carl

Others
Garcia, Greg –
Garcia Cyber Partners
Quick, Frank –
Qualcomm Technologies Inc.

**Participated remotely*

Call to Order – *Dr. Alan Taub, VCAT Chair*

Dr. Taub called the meeting to order at 11:00 a.m. and pointed out the emergency exits. NIST had a delayed opening due to the weather and the agenda was revised slightly.

NIST Update and Agenda Review – *Dr. Patrick Gallagher, Under Secretary of Commerce for Standards and Technology and NIST Director*

Presentation Summary – Dr. Gallagher highlighted NIST safety statistics, departing and incoming VCAT members, NIST recipients of major external awards, the fiscal year (FY) 2014-2016 budget, the Department of Commerce (DOC) Strategic Plan, themes relevant to NIST in the State of the Union (SOTU) address, NIST organization/staff changes, NIST program updates, and charges to the VCAT Manufacturing and Cybersecurity subcommittees.

With regards to Safety, the number of Occupational Safety and Health Administration (OSHA) recordable cases as well as those that resulted in employee Days Away, Restricted, or Transferred (DART) have decreased at NIST for each of the past three fiscal years due to NIST management attention and the VCAT's increased focus on safety. The VCAT Chair congratulated Dr. Gallagher on his recent recognition by the National Safety Council as one of its 2014 "CEOs Who Get It" leaders who demonstrate a personal commitment to safety. Dr. Gallagher acknowledged the role of the VCAT and the entire NIST staff in helping to achieve this recognition.

Turning to membership, former NSF Director Rita Colwell has joined the VCAT. Dr. Gallagher thanked outgoing VCAT members Pradeep Kholsa and VCAT Chair Alan Taub for their service to the Committee and to NIST.

Several NIST researchers were recognized for their outstanding achievements. Ana Maria Rey was named a 2013 MacArthur Foundation Fellow; Dan Madrzykowski won the 2013 Service to America Citizens Services Award; and Deborah Jin will receive the 2014 Comstock Prize in Physics. In addition, Gretchen Campbell, Joe Kline, and Ana Maria Rey were nominated for Presidential Early Career Awards for Scientists and Engineers.

As usual, NIST is dealing with three budgets at the same time. Since the FY 2014 budget agreement has been reached, NIST has been able to discuss FY 2015 priorities without having to develop counter proposals based on different FY 2014 funding scenarios as done in past years. NIST has also begun planning for the FY 2016 budget request. The FY 2014 budget for NIST is an increase of $81 million over the FY 2013 budget, with the largest increases associated with the Laboratory Programs. The Manufacturing Extension Partnership (MEP) and the Advanced Manufacturing Technology Consortia (AMTech) program received small increases over FY 2013 while the construction account remained basically stable.

DOC began a new and very compressed strategic planning process following Secretary Pritzker's external and internal listening tour in her first one hundred days of office to discuss priorities, including meetings with over 400 CEOs around the country. NIST is well represented in each of the new Strategic Plan's four goals: trade and investment; innovation; data, and environment. The operational excellence goal cuts across all of these activities. The White House has embraced this plan which will serve as the context for framing the FY 2015 and FY 2016 budget planning exercises. NIST programs were also extremely well represented in the themes related to the FY 2015 budget priorities revealed in the President's 2014 SOTU address.

A new Communications Technology Laboratory in Boulder has just been approved on the Hill as part of the NIST organization structure. Also, Bob Fangmeyer is the new director of the Baldrige Performance Excellence Program; Harry Harary is the Acting Director of the Engineering Laboratory, and a new Office of Acquisition and Agreements Management led by Cecilia Royster has been established under the Associate Director for Management Resources.

An update on selected NIST programs was provided. NIST is very excited about its new Center of Excellence program which made its first award to a new Center for Hierarchical Materials Design Consortium led by Northwestern and is closely tied to the President's Material Genome Initiative. Forensic Science has been extremely active and the first meeting of the National Commission on Forensic Science, co-chaired by the Department of Justice Deputy Attorney General and the NIST Director, was held on February 3-4, 2014. In addition, the public has responded positively to the NIST process for the "Organizations of Scientific Area Committees."

In the area of cybersecurity, the National Strategy for Trusted Identities in Cyberspace (NSTIC) remains a priority for NIST with the second round of pilots awarded in September and the Federal Funding Opportunity for the third round of pilots released in January. NIST will release the final Cybersecurity Framework for Critical Infrastructure on February 12, 2014, which meets the deadline in the Executive Order. The response to the approach has been overwhelmingly positive and many companies appreciated that the process was industry-driven.

Turning to manufacturing, AMTech launched its first competition for grants on July 24, 2013. Proposals were due October 21, 2013, and the response has been positive. In September, NIST awarded two measurement science grants for additive manufacturing research to Northern Illinois University and the National Additive Manufacturing Innovation Institute. The Advanced Manufacturing Partnership 2.0, a working group of the President's Council of Advisors on Science, has been renewed. With regard to the National Network for Manufacturing Innovation (NNMI), the President announced in the 2014 SOTU that his Administration will be launching six more institutes in 2014.

Lastly, Dr. Gallagher reviewed the charges to the VCAT Subcommittees on Manufacturing and Cybersecurity. The Manufacturing Subcommittee is charged to: 1) assess NIST's approach to meeting the needs of a changing technology landscape in advanced manufacturing; and 2) review and provide recommendations regarding NIST's approach to research, collaboration, technology transfer, and outreach across multiple programs on a single advanced manufacturing technology area. The VCAT can help NIST articulate the role of its different manufacturing programs and how they interact, and, in particular, determine if the NIST laboratory programs in advanced manufacturing have the right touch points to be maximally effective.

As context for the charge to the Subcommittee on Cybersecurity, Dr. Gallagher noted the challenges and the external focus associated with NIST's cybersecurity programs. The Subcommittee is charged to: 1) make recommendations to position NIST to best respond to the nation's cybersecurity needs; and 2) comment on what tools or mechanisms organizations require to address their cybersecurity risk. In other words, does NIST have the right mix of capacities? In response to recent concerns about the integrity of NIST's cryptographic standards and guidelines, NIST publicly committed in November 2013 to having an independent organization conduct a formal review of its cryptographic standards develop approach. Hence, the Subcommittee's charge was expanded to engage external experts in reviewing NIST's cryptography standards development processes.

For more details, see Dr. Gallagher's presentation.

Discussion – The group discussed the following topics:

- Budget - NIST plans for managing the large budget growth in the NIST laboratories include funding grants and contracts as well as hiring new staff.
- NNMI and AMTech Distinction –The NNMI is a consortia that runs an Institute in contrast to AMTech which seeds a consortia. Both of these programs are managed by the NIST Advanced Manufacturing Program Office.
- Manufacturing Subcommittee – Both parts of the subcommittee's charge are important priorities to address at the afternoon subcommittee meeting.

NIST Safety Update – *Dr. Richard Kayser, NIST Chief Safety Officer*

Presentation Summary – Dr. Kayser began his presentation by sharing a quote from Pat Gallagher's interview in the National Safety Council's *Safety and Health* magazine regarding his recognition as one of 2014's "CEOs Who Get It" in which he describes why safety is a core value at NIST. His presentation also included a review of NIST safety incident metrics, the Shared Standard of Safety Performance, incident reduction, and progress in the incident investigation backlog.

NIST safety incidents continue to improve. So far in FY 2014, there were 3 OSHA recordable cases (RC) and two of these were DART cases. NIST is encouraged but not satisfied. A breakdown of incidents by directorates from FY 2011 – FY 2013 shows that Management Resources, the Laboratory Programs, the Director's Office, and Innovation and Industry Services are making progress.

The Shared Standard of Safety Performance is a new program established to identify existing common safety issues, communicate common safety issues and solutions, monitor conditions in NIST spaces, track progress on eliminating common safety issues, and identify new common safety issues of concern. The list of common safety issues was a bottom's up effort and owned by all. The Shared Standard initiative was based on the VCAT's recommendation to train NIST executives on common safety issues and to play a role in making sure these issues do not occur in their organization. Last summer, all 28 NIST executives were trained on common safety issues at NIST. In October 2013, they agreed on the first set of common safety issues for FY 2014: eliminate tripping hazards, use electrical cords safely, and label all chemicals properly. Dr. Gallagher announced this initiative to all staff at a town-hall meeting in December 2013. The NIST internal website for this Shared Standard includes management's expectations, resources, and videos for each of the three issues and also directs the staff to contact the Office of Facilities and Property Management for correcting common safety issues that they cannot address themselves.

Incident reduction is another effort that was driven by discussions with the VCAT. NIST is focusing initially on reducing the occurrence of slips, trips, and falls since 37 percent of its OSHA RCs and 37 percent of its DART cases occurred in this category from FY 2011 - FY 2013. As part of this effort, NIST analyzed the hazards associated with the slips, trips, and falls, and developed a set of planned actions to address each of these hazards, including uneven surfaces, snow/ice/rain, and wet/slippery surfaces indoors.

As a result of significantly increasing the openness and transparency of its incident reports and incident investigation reports to the OUs, the backlog of incident investigation reports outstanding for more than 20 business days decreased from 56 in October 2012 to less than 10 in January 2014.

Lastly, backup slides are available which provide the absolute numbers of incidents in RCs and DART cases, including the number of employees versus associates, and rate comparisons between NIST and the Department of Energy laboratories.

For more details, see Dr. Kayser's presentation.

Discussion – The group discussed the following topics:

- The Shared Standard of Safety Performance addresses cultural change which is difficult but will have the highest impact. Expectations and accountability are important components of this Standard.
- NIST awards exist to recognize an individual, groups, and/or organizations for contributions to improving NIST safety.
- A VCAT member described how Dr. Gallagher's "CEOs Who Get It" award is extremely important to NIST employees who are helping to reduce the number of incidents and in meeting one of the goals of the NIST Blue Ribbon Commission for the agency to be recognized by the outside community for its safety.
- Dr. Kayser's contributions to NIST's safety improvements were also noted and the group applauded his success. Dr. Kayser emphasized that a team effort involving many individuals across the organization was responsible for NIST's progress.
- The VCAT Chair acknowledged the team for its tremendous progress in safety and emphasized that continuous improvement is needed because the journey is never over.
- The NIST Director noted the importance of the partnership that has developed since 2008 between the laboratory programs and the Safety organization in helping to improve the NIST safety culture.

Context Setting for NIST's User Facilities Session – *Dr. Willie May, Associate Director for Laboratory Programs and Principal Deputy*

Presentation Summary – Dr. May noted that NIST is a mission-driven agency and serves as industry's national laboratory. NIST's authorizing legislation updated in 2008 includes three specific NIST functions for providing assistance to industry. These functions involve developing measurement methods and tools, supporting technology development, and operating user facilities. In its 2010 reorganization, NIST moved from a discipline-based organization to a mission-based organization which is closely aligned with these functions.

The VCAT has conducted deep dives of some of the activities in NIST's two metrology laboratories and its two technology laboratories. This meeting will focus on the activities of NIST's two national user facilities: the Center for Nanoscale Science and Technology (CNST) and the NIST Center for Neutron Research (NCNR).

For more details, see Dr. May's presentation.

NIST Center for Neutron Research (NCNR) – *Dr. Rob Dimeo, Director, NCNR*

Presentation Summary – In his introductory remarks, Dr. Dimeo noted that the NCNR is one of a number of government- funded national user facilities in the U.S. but is the only national neutron facility with the unique mission to provide neutron measurement capabilities to U.S. researchers from industry, university and Government agencies. Serving industry is the key feature which differentiates the NCNR from the other two national neutron facilities operated by the Department of Energy (DOE) in Los Alamos, CA, and Oak Ridge, TN. He then reviewed the NCNR's operations and emphasized how it serves the general scientific community, including industry. The NCNR is equipped with 28 instruments which is more than any other facility in the country.

Dr. Dimeo described the importance and provided examples of using neutron scattering for viewing the structure of materials at the atomic and molecular scale with exquisite resolution. The instruments at the NCNR provide broad coverage to characterize all different kinds of materials at different time and length scales.

The NCNR successfully completed its new guide hall, a $100 million five-year major expansion to increase its cold neutron measurement capability and capacity, including a suite of new instrumentation. This expansion addressed a significant supply-demand mismatch in the United States and the NCNR now leads North America in cold neutron measurements. The NCNR instrument timeline from 1990 - 2017 illustrates the balance of developing and operating new instruments while shutting down others. NIST will be holding a new workshop with the scientific community to continue to understand its needs.

Access is currency at a user facility. Most of the NCNR beam time is allocated based on a peer-reviewed proposal process and without charge consistent with national policy. Robust user support is required for general access by non-experts. Collaborative access (i.e., collaborations between the NCNR in-house staff and external users) yields high productivity per user and is good for specialized measurement types. Partnership access is used for the development and operations of selected instruments. Proprietary access is available for researchers who do not wish to make their results public and full-cost recovery is charged for these users. Consortia access emphasizes expertise transfer and can address problems of interest common to the consortium members.

The National Academies of Sciences (NAS) which assesses the NCNR every two years requested metrics that illustrate how the NCNR maximizes scientific productivity. The NCNR serves over 2000 research participants per year and operates 28 instruments about 250 days per year for a total of 7,000 instrument days per year. With roughly 300 publications per year, the FY 2013 NAS assessment panel noted that the NCNR ranked among the top three facilities world-wide in terms of the number of high-impact publications. The decrease in publications in 2013 was due to the NCNR partial operations and the number is expected to exceed 400 in 2014. In addition to working with about 40 companies per year, the NCNR focuses on technology transfer in the form of education to post-doctoral researchers, students, and faculty.

The number of research participants is expected to increase by 400 or 500 over the next four or five years. The NCNR is not a regional facility and serves a broad community. The U.S. research participants come from all over the country. The lower percentage of industrial participants since 2008 reflects the economic downturn. To address this issue, NCNR is trying to engage industry through consortia and other types of partnerships.

Two examples of industry's use of the NCNR were provided. In 2006, researchers from Rohm and Haas used the NCNR sheer cells to measure the structure of paint under shear. These measurements led to an accelerated development of new products which would not have been possible without the Ultra Small Angle Neutron Scattering (USANS) instrument. Anton-Paar now markets the Rheo-SANS capability developed by the NCNR.

An example of an application for neutron stress measurements highlighted a recent collaboration with the Engineering Laboratory for measuring the stresses in a test artifact produced by laser-based additive manufacturing. The test artifact was placed into the NCNR's residual stress instrument and rotated in several directions which provided a first-in-kind measurement on the mechanical properties of these types of artifacts. This instrument will be upgraded over the next few years.

Lastly, Dr. Dimeo described nSoft, a new consortium for the advancement of neutron-based measurements for manufacturing of soft materials. The nSoft is a partnership between NCNR and the Materials Measurement Laboratory. In this consortium model, members are working on problems of common interest and pay a nominal fee. The premise of nSoft is expertise transfer with members paying $20,000 per year for NIST to help them solve their problems and eventually gain the expertise to conduct the measurements on their own. There are currently eight nSoft members from industry and academia and membership is expected to grow.

Discussion – The group discussed the following topics:

- NCNR may be undercounting its industry participants. To augment this number and improve the optics of its industry participation, NCNR should consider asking their academic partners if their work is supported by an industry collaboration.
- NCNR access and wait time varies between instruments and the particular mechanism. Collaborative and proprietary users usually gain access quicker than general users.

For more details, see Dr. Dimeo's presentation.

NIST's Center for Nanoscale Science and Technology (CNST) – *Dr. Robert Celotta, Director, CNST*

Presentation Summary – Dr. Celotta presented an overview of the CNST, including its mission, structure, operations, participating institutions, and examples of success stories.

Established in 2007, the CNST is NIST's nanotechnology user facility. An earlier VCAT subcommittee chaired by Paul Fleury helped guide its direction and growth. The CNST's mission is to help enable innovation in technology by providing rapid access to the tools and processes needed to make and measure nanostructures. The CNST has a unique, two-part hybrid design. The CNST NanoFab, modeled like the National Science Foundation (NSF)-supported university nanocenters, is a national shared resource with commercial state-of-the-art tools for the fabrication and measurement of nanostructures and is open to all. The CNST NanoLab, modeled like the DOE nanocenters, advances nanotechnology by developing new measurement solutions and supports the NanoFab with expert consultation.

The CNST NanoFab consists of 60,000 square feet of labs, a class 100 clean room, about 100 major tools, and talented technical staff who train and assist users, operate and maintain the tools, and develop and control the processes. Through the NanoFab, external researchers are connected to the extensive measurement resources in the NIST Laboratories and Centers. The NanoFab's operating principles were based on industry input on important characteristics, including rapid access, equipment capability, and intellectual property policies. Charges are based on operating costs and researchers may apply for reduced rates if the project advances the CNST mission. Users maintain the intellectual property (IP) rights for sole and joint inventions. Two examples of successful industry projects at the CNST NanoFab involved Lumedyne, a small start-up company that develops high performance MEMS sensors and energy harvesters, and IBM that wanted to develop a process for identifying and correcting device misalignment in multi-wafer assemblies for next-generation supercomputers.

The CNST NanoLab responds to user needs for measurement and fabrication beyond current commercial state-of-the art through collaborations, with current priorities in nanomanufacturing and nanofabrication, future electronics, energy, and nanomedical bio, the newest area. The work of the NanoLab is integrated with the NanoFab and complements and supports the NIST metrology and engineering laboratory programs. An example of a successful NanoLab collaboration between Georgia Tech, Columbia University, the Nanoelectronics Research Institute, and the NIST Physical Measurement Laboratory involved a new tool for graphene research and spurred a standards process for resistance standards using graphene.

Research participation at the CNST has grown since its inception. Currently, about 1,700 research participants are involved with the CNST. Industry accounted for 36 percent of the number of unique participating institutes in FY 2012 and is growing rapidly. Although education is not part of the CNST mission, a great deal of technical training is provided to postdocs, students, and Visiting Fellows. For example, a new CNST-NSF NanoFab-Community College Internship Program is just beginning.

Discussion – The group discussed the following topics:

- Royalty rights for joint inventions are negotiated and can be exclusive or non-exclusive.
- The government shutdown in October 2013 had a significant impact on the CNST NanoFab users, especially individuals from industry, who were not allowed access. This topic will be included in the 2013 VCAT Annual Report.
- The CNST as well as the NCNR are collecting good examples of technology transfer. The NIST Technology Transfer Committee will be working on how to evaluate the economic impact of the technology transfer projects.
- The VCAT can help publicize how industry can easily access the CNST.

For more details, see Dr. Celotta's presentation.

NIST Resilience Initiative – *Mr. Stephen Cauffman, Lead, Disaster Resilience, Materials and Structural Systems Division, Engineering Laboratory (EL)*

Presentation Summary – Mr. Cauffman described the need for a NIST program to develop a Disaster Resilience Framework and Model Resilience Guidelines, EL's core competencies related to disaster resilience, statutory authorities, community needs for the built environment, NIST's technical team and stakeholder engagement in disaster resilience, NIST's technical approach including the formation of a Disaster Resilience Standard Panel (DSRP), and the scale-up of resilience strategies for the built environment.

Natural and man-made disasters cause an estimated $57 billion in average annual costs and large single events, such as Hurricane Katrina, can cause losses exceeding $100 billion. The current approach of response and rebuilding is impractical and inefficient for dealing with natural disasters. A resilience based-approach will provide the framework and guidance needed to enable communities to resist, respond to, and recover from hazard events more rapidly and at lower costs.

Over the years, EL has developed a number of core competencies relating to disaster resilience, such as fire modeling and prediction at the building and community scale, hazard analysis, and wind/storm surge load characterization. NIST also has several statutory authorities covering the National Earthquake Hazard Reduction Program; disaster and failure studies, such as the National Construction Safety Team Act; and the National Windstorm Impact Reduction Program.

Functional requirements for buildings and infrastructure are driven by the needs of a community's citizens, government, retail businesses, and industries. Natural hazards, manmade hazards, degradation, and the new driver, climate change, affect community resilience. To resist these negative forces, it is important to address performance goals for the infrastructure, mitigation actions, and response and recovery efforts. Through the FY 2013 initiative, NIST began its program to provide the measurement science and convener role to develop a comprehensive Disaster Resilience Framework and develop Model Resilience Guidelines for critical buildings and infrastructure lifelines. The Disaster Resilience Framework 1.0 will focus on the role that buildings and infrastructure lifelines play in ensuring community resilience. The NIST technical team for this effort will consist of a lean NIST program team, a resilience "Tiger Team," and a technical and administrative support contractor. NIST is also engaged in this effort with many Federal stakeholders, including the Executive Office of the President, and with the external stakeholder community, including codes and standards organizations as well as state, local, and regional officials.

The President's Climate Action Plan calls for the Framework to be developed in April 2015. NIST will draft the Framework 1.0 and gather input through a series of quarterly regional workshops with external stakeholders. The first version of the Framework will provide the basis for convening a DSRP to lead the

development of the Disaster Resilience Framework 2.0 and the Model Resilience Guidelines. Modeled after the approach used for the Smart Grid Interoperability Panel, the DSRP will be formed to represent the broad interests of the stakeholder community with respect to disaster resilience and regional variations in perspectives.

Lastly, with new funding in FY 2014, NIST will develop science-based tools for resilience assessment of critical buildings and infrastructure lifelines and for evaluating options for enhancing resilience in the short, medium, and long term at the community scale.

Discussion – The group discussed the following topics:

- Representatives from EL's Applied Economics Office are involved in the resilience "Tiger Team" and will help develop a decision support methodology for communities to use to best optimize their investments.
- To address the critical national need in disaster resilience, the core NIST "lean" program team will be supplemented by a group of Disaster Resilience Fellows who will bring expertise not currently available in-house. Also, as part of the new FY 2014 funding, NIST is identifying additional positions, such as an expert in systems engineering.
- The NIST Director is concerned about the balance between the increasing and extensive expectations placed on NIST in disaster resilience and NIST's capacity in this area. This topic will be discussed in more detail at a future meeting and will be deferred to the VCAT's 2014 Annual Report.

For more details, see Mr. Cauffman's presentation.

VCAT Subcommittee on Manufacturing Recommendations and Discussion – *Dr. Sujeet Chand, Chair, VCAT Subcommittee on Manufacturing*

Discussion Summary – The NIST Director established a VCAT Subcommittee on Manufacturing for 2013, chaired by VCAT member Dr. Sujeet Chand. The other VCAT subcommittee members are: Uma Chowdhry, Karen Kerr, Darlene Solomon, Alan Taub, and John Tracy. Dr. Chand reviewed the subcommittee's observations and recommendations under each of the two roles assigned to the subcommittee for deliberation by the full Committee. Based on these deliberations, the VCAT adopted the observations and recommendations shown below which will be issued in its 2013 Annual Report.

1. Assess NIST's approach to meeting the needs of a changing technology landscape in advanced manufacturing. Particularly, review NIST's methods for identifying emerging trends and provide recommendations regarding NIST's mechanisms for developing technical capabilities with necessary agility.

   Observations:

   - The VCAT fully supports the work at NIST, and feels strongly that NIST's measurement science mission, its unique and longstanding relationship with industry, and its broad portfolio of programs make it a critical element of the Administration's efforts to strengthen manufacturing in America. The VCAT observed that NIST's project portfolio in advanced manufacturing is well aligned with industry needs and the quality of work is world-class.
   - The VCAT notes the agility of the NIST organization in responding to renewed focus on advanced manufacturing.

Recommendations:

- The VCAT recommends that NIST consider publishing technology and standards roadmaps where measurement science is an enabler for advanced manufacturing technologies such as Additive Manufacturing.
- The Committee acknowledges NIST's leadership in convening workshops and developing roadmaps in new initiatives such as Additive Manufacturing, and recommends expansion of such workshops to produce roadmaps for additional advanced manufacturing areas.
- The VCAT strongly endorses the dedication and commitment of NIST leadership to apply NIST resources in a way to maximize agility and responsiveness of the organization.
- The VCAT strongly supports the growth of budget and capabilities within NIST to expand focus on advanced manufacturing leveraging the well-established core NIST focus on metrology and standards which remain critical to industry.

2. Review and provide recommendations regarding NIST's approach to research, collaboration, technology transfer, and outreach across multiple NIST programs on a single advanced manufacturing technology area, using additive manufacturing as a case study.

   Observations:

   - The NIST lab programs that were reviewed by the VCAT demonstrated inter-lab collaboration as well as collaboration with third parties. The Committee notes significant examples of technology transfer activities that go beyond patents and licensing to include training, publications and new products. In particular, user facilities at NIST are highly beneficial for training.
   - The VCAT notes that NIST's technical staff and leadership understands the potential of Additive Manufacturing and the barriers to its commercial implementation and NIST researchers have identified key R&D needs to move Additive Manufacturing forward.
   - NIST is aware of global activities in Additive Manufacturing. The VCAT notes collaboration with European Union through ISO and ASTM international standards committees.
   - The VCAT believes that the long standing support of U.S. manufacturers provided by the NIST Labs and the well-established MEP program will be significantly strengthened by the addition of the new AMTech and NNMI programs to the NIST portfolio.

   Recommendations:

   - The VCAT recommends that the Additive Manufacturing portfolio be fully resourced.
   - The VCAT strongly recommends that NIST continues to take a lead role in global standards for Additive Manufacturing.
   - The VCAT believes that the way NIST has positioned itself in Additive Manufacturing with the America Makes program is a good base that needs to be expanded as future NNMI's are launched.
   - The VCAT endorses the overall approach that the NIST leadership has presented to the Committee to optimize the synergy between the NIST advanced manufacturing laboratory programs and the new extramural initiatives.

VCAT Subcommittee on Cybersecurity Recommendations and Discussion – *Dr. Roberto Padovani, Chair, VCAT Subcommittee on Cybersecurity*

Discussion Summary – The NIST Director established a VCAT Subcommittee on Cybersecurity for 2013, chaired by VCAT member Dr. Roberto Padovani. The other VCAT subcommittee members are: Rita Colwell, Tony Haymet, Bill Holt, Pradeep Khosla, and Al Romig. Dr. Padovani reviewed the subcommittee's observations and recommendations in response to its twofold role for deliberation by the

full Committee. Based on these deliberations, the VCAT adopted the observations and recommendations shown below which will be issued in its 2013 Annual Report.

1. To make recommendations to position NIST to best respond to the nation's cybersecurity needs. Specifically,
    a. How can NIST ensure that it has the optimum balance between responding to short-term priorities and cultivating long-term technical expertise?
    b. How can NIST confirm that its methods of partnership, collaboration, and communication are sufficient to meet stakeholder's needs?; and
2. To comment on what tools or mechanisms organizations require to address their cybersecurity risk. More specifically, (a) is the development of a fundamental cybersecurity risk measurement method important, (b) what role would economic modeling play in risk measurement, and (c) what tools do corporate Chief Risk Officers require to assess their cybersecurity risk?

Observations:

- The VCAT is pleased with the progress achieved within the National Cybersecurity Center of Excellence, especially the enlisting of more than a dozen industry partners and the continued effort to recruit additional partners. The projects and use cases under development are highly relevant and the expansion of such projects is only limited by resources at this stage.
- The VCAT is also very pleased with the level of effort and planning that the Information Technology Laboratory puts into its outreach and partnership mechanisms and encourages it to continue and expand such activities. It also recommends studying mechanisms for obtaining measurable feedback about such partnerships from the stakeholders for further improving the effectiveness of such key efforts.
- A major NIST accomplishment in 2013 has been the execution in the implementation of Executive Order 13636, namely the creation of the Cybersecurity Framework for Critical Infrastructure. The Framework was completed on time and the VCAT is particularly pleased with NIST's approach to attract and engage the largest possible set of stakeholders both public and private, and with NIST's role as the convener and facilitator of a joint development effort. The feedback VCAT has received has been unanimously positive. The VCAT is also pleased to learn that NIST intends to participate in future activities related to the framework and that it is also investigating long term governance solutions.
- The VCAT is also satisfied that NIST is achieving a good balance between the needs to cover short-term activities, such as the Cybersecurity Framework development, and long-term needs such as fundamental research. The VCAT was concerned that short-term activities would undermine the efforts in fundamental research but at this point in time it does not appear to be the case.
- The VCAT values highly the ability of NIST to contribute independent technical expertise to international standards development processes for cryptography. In 2014, VCAT will lead an effort to validate NIST's internal development processes.

Recommendations:

- The VCAT recommends that NIST continues to participate in the activities related to the Cybersecurity Framework beyond the publication of its first version. It also encourages NIST to investigate long-term governance solutions for the effort.
- The VCAT recommends that NIST remain vigilant about the tradeoffs between short-term activities and the need for world class capabilities in the fast changing and extremely complex security landscape. This is an area that should be closely monitored and the VCAT recommends that some metrics be employed to assess such balance going forward. These metrics could also be applied to other major programs.

VCAT Elections and Deliberations and Presentations on Initial Observations, Findings and Recommendations of 2013 Annual Report – *Dr. Alan Taub, VCAT Chair*

***Elections* –** The VCAT members elected Tony Haymet as the new VCAT Chair and Darlene Solomon as the new VCAT Vice Chair for a two-year term beginning April 1, 2014, and ending March 31, 2016. Secret ballots and absentee ballots were used for this election.

***Summary of Deliberations and Presentations on Initial Observations, Findings and Recommendations of 2013 Annual Report* –** Alan Taub reviewed the draft 2013 VCAT Annual Report and solicited comments from the members as well as NIST leadership on the initial observations, findings, and recommendations for deliberation by the Committee in the following areas:

- NIST Safety;
- NIST User Facilities and Partnership Models, including NIST's new Center of Excellence program and the Center for Advanced Communications;
- Forensic Science; and
- NIST Budget and Planning, including the impacts of the Government shutdown.

The Annual Report will also cover the NIST roles in advanced manufacturing and cybersecurity to reflect the Committee's earlier deliberations on the observations and recommendations from the respective VCAT Subcommittee.

The report is due to the Secretary of Commerce for submission to Congress not later than 30 days after the President's annual budget request is submitted to Congress. The final report will be available on the VCAT website at http://www.nist.gov/director/vcat/index.cfm .

Adjournment

The meeting was adjourned at 1:00 p.m. on Thursday, February 6, 2014.

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

Gail Ehrlich, Executive Director, NIST Visiting Committee on Advanced Technology
Dr. Tony Haymet, Chair, NIST Visiting Committee on Advanced Technology