Testimony of
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on

Setting the Standards: Strengthening U.S. Leadership in Technical Standards

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Introduction

Chairwoman Stevens, Ranking Member Feenstra, and members of the Subcommittee, I am Dr. James Olthoff, Performing the Non-Exclusive Functions and Duties of the Under Secretary of Commerce for Standards and Technology & Director, of the Department of Commerce's National Institute of Standards and Technology (NIST). I want to thank you for the opportunity to discuss the current dynamics in the world of international standards, and NIST's role in the opportunities and challenges presented. With growing attention and investment from our key trading partners and strategic competitors in standards, this is a very timely hearing.

According to a Department of Commerce report[1], approximately 93% of global trade is affected by standards or technical regulations. Considered within the context of explosive growth in global trade, standards impact trillions of dollars in trade.

With the emergence and growth of new technologies, such as those needed for the development and deployment of advanced communications (5G and beyond), additive manufacturing, artificial intelligence (AI), biotechnology, and quantum information science, these are exciting times in the standards world. International standards and broadly accepted conformity assessment programs play a critical role in the innovation and commercialization of these technologies. With strong innovation and technology sectors, and long-standing government support for scientific research and development (R&D), the United States has historically been a leader in international standards development.

In my testimony, I will address the impact of standards on innovation and competitiveness, the role of the U.S. government in the international standards system, the challenges that NIST currently faces, and the efforts to address these challenges.

Why Standards Matter

It is easy to forget how much America depends on standards every day. For example, the operation of the sprinkler heads providing automatic fire suppression in the room in which many of you sit are dictated by standards. As panelists, our remote participation in this hearing is thanks to standards for computers, networking devices, the internet, video and sound.

Standards also help to ensure our health and safety. From defining the size, color, shape and positioning of roadway stop signs; to determining safe levels of exposure to radiation when getting an x-ray or mammogram; to using a credit card globally, standards underpin our daily interactions.

Broad use of standards helps enhance the safety and security of products, reduce consumer costs and provide consumer choice. Widespread reliance on standards also creates tremendous market opportunities for those with ideas and technologies that can be standardized and used around the world. In an increasingly global economy, ignoring standards can have severe consequences for industry and government.

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[1] Jeff Okun-Kozlowiki, Standards and Regulations: Measuring the Link to Goods Trade, DoC/ITA, https://legacy.trade.gov/td/osip/documents/osip_standards_trade_full_paper.pdf

U.S. competitiveness in technology requires leadership by U.S. industry in standardization. Leadership in standardization provides a first-mover opportunity to drive technological innovation. However, such active participation and leadership also requires significant time and resource commitments. Today, U.S. industry is faced with very tough choices regarding investment in standards activities, the benefits of which may not be evident in the short- or medium-term. This can be an even more significant issue for small and medium-sized enterprises that may not have the resources to invest in standardization.

Standards as Engines of Innovation

Standards play an important role in enabling technological innovation by defining and establishing common foundations for product differentiation, technological innovation, and the development of other value-added services. Standards are also essential for enabling seamless interoperability between products and systems. Thus, standards are often the technical foundation enabling global trade, competitiveness, and innovation.

Standards as a Tool for International Competitiveness

"Third class companies make products, second class companies develop technology, while first class companies set standards."

This quote, often attributed to Sony Corporation, resonates with industry and policy makers around the world. It also explains the significant investments made by countries such as China to increase participation and to attempt to assume leadership positions in international standards activities. Increasingly, developing economies see international standards as a powerful tool for competitiveness, and are deploying strategies and tactics to play greater roles in international standardization.

NIST welcomes increased participation, as NIST believes that the best standards are made with broad participation representing all interested stakeholders in open and transparent fora. These reflect the consensus of a diverse group, and when used as intended in multiple markets, such standards drive significant economies of scale. The U.S. government has long advocated for countries to consider adopting and using international standards where available, and that the opportunity to participate in standardization activities in other countries should be made available to all interested stakeholders.

Principles for Effective Standardization

A limited set of foundational attributes of standardization activities is called out in Office of Management and Budget (OMB) Circular A-119[2], focusing on voluntary, consensus standards activities. These attributes include openness, balance of interest, due process, appeals process, and consensus. These attributes are aligned with those agreed upon by the World Trade Organization Committee on Technical Barriers to Trade. As the pace of technology innovation continues to increase, new approaches to standardization evolve to meet the technical challenges.

[2] https://www.nist.gov/system/files/revised_circular_a-119_as_of_01-22-2016.pdf

The Standards Ecosystem

In the U.S., our voluntary, consensus standards system is bottom-up, industry-driven, and sector-focused. The government participates as an equal and interested partner. Federal, state, local and tribal government representatives participate when the activity is relevant to their needs, and consistent with their respective missions and functions. In contrast to the government-directed, prescriptive standards that characterize the systems in place in a number of other countries, the Federal government does not control or direct the standards system in the United States.

U.S. government agencies have been historically involved in the development and use of standards to meet agency missions and priorities. This engagement was catalyzed in 1995 by the passage of the National Technology Transfer and Advancement Act (P.L. 104-113, NTTAA), which directed Federal agencies to "use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments",[3] except where inconsistent with applicable law or impractical. The standards provisions of the NTTAA and OMB Circular A-119 reflect the U.S. government's commitment to the U.S. industry-led, voluntary consensus standards system.

The strength and agility of the U.S. voluntary consensus standards system stems from its sector-specific focus. Individual industry and technology sectors are served by standards developing organizations that are sensitive to and responsive to a sector's needs and understand the dynamics of that technology and industry. There are hundreds of standards developers in the United States, and many of them are global leaders in their fields. The membership and organizational structure of these organizations vary widely: some are professional societies closely associated with a technology or technical sector; others are industry associations, and others are standards setting organizations that are not associated with a specific technical sector.

The Federal Government's Role and Interest

Federal government agencies engage in standardization in a wide range of mission-specific roles, including contributing to development of standards in the private sector, championing U.S. interests in standards, using standards for procurement or regulatory actions, and addressing competition-related aspects of standards-setting activities.

Thousands of Federal agency staff from across the Federal enterprise participate in hundreds of private-sector standards organizations. This participation is spurred in large part by the NTTAA and OMB Circular A-119. The NTTAA directs agencies to participate in the development and use of voluntary consensus standards, and to do so in lieu of government-unique standards whenever possible. But it is not really about the numbers. It is about participation and impact. Agencies participate in standards development activities to ensure that the resulting standards are

[3] P.L.104-113 National Technology Transfer and Advancement Act of 1995, Section 12 (d)(1).(available at: https://www.congress.gov/104/plaws/publ113/PLAW-104publ113.pdf)

better suited to meet agency needs. For example, the Consumer Product Safety Commission participates in standards organizations developing toy safety standards.

This participation by Federal agency staff, and the use of the resulting standards, provides direct benefits to agencies and to taxpayers. The use of consensus standards significantly reduces costs to agencies that would otherwise be incurred if agencies had to develop and maintain agency-unique standards. The use of consensus standards also reduces the cost to agencies due to economies of scale resulting from using the same standards for government as are used for the commercial sector, and spurs innovation and greater product choice. Currently, more than 8000 different consensus standards are pointed to in more than 24,000 references in regulations. Such extensive use of consensus standards has provided huge benefits to the United States.

It is important to appreciate that participation in international consensus standards development by Federal agencies does not equal a passive engagement or abdication of Federal responsibilities to the private sector. NIST recognizes that for certain sectors of exceptional national importance, self-organization may not produce a desirable outcome on its own in a timely manner. In such instances, where time is of essence to address national priorities, the Federal government can play the important role of an "effective convener" to catalyze standards development critical for these sectors. Current national priorities include the development and deployment of artificial intelligence (AI) systems, bioscience technologies, robust cryptography for a post-quantum world, and cybersecurity standards for securing Federal government IT systems and the interactions of these systems.

NIST's Role in the U.S. Standards System

NIST plays a critical role in the standards process as the nation's measurement laboratory and has a unique role relating to standards in the Federal enterprise. Our coordination function, defined by the NTTAA and the NIST Organic Act (15 U.S.C. 271), has been borne out by a track record of technical excellence and objectivity, and embraced by NIST's world-class scientists and engineers, ever since the Institute was established by Congress in 1901. NIST's strong ties to industry and the standards development community, have enabled NIST to take on critical standards-related challenges and deliver timely and effective solutions.

Standards and standardization enable U.S. technological innovation and global competitiveness. Standards enable the effective and efficient transfer of technology from the NIST laboratories to the marketplace. This is further made possible by the participation of nearly 570 NIST technical staff in over 300 standards organizations, and more than 3000 different standards activities, in support of domestic and international priorities. This number represents more than a quarter of the NIST technical staff. NIST's engagement with industry in these standards activities also provides us the ability to learn first-hand about industry's measurement, standards, and research needs, providing valuable input into our prioritization of current NIST programs and our planning for future programs.

The U.S. Government's Standards Expert and Leader

NIST has a long history of influence and leadership in the development of voluntary standards for the emerging technologies of the time such as advanced communications, AI, security for the Internet-of-Things (IoT) and connected vehicles.

As the leaders in standards for the Federal government, NIST shares its standards knowledge and expertise with other agencies through coordination and training activities. Over the last 12 years NIST has held 121 standards-related training events for more than 7,700 federal attendees. Our AI Lead serves as the Federal AI Standards Coordinator and is a member of the National AI Research Resource Task Force.

The Interagency Committee on Standards Policy (ICSP), chaired by NIST, coordinates with standards executives across the federal government to increase agencies' knowledge and effectiveness on key standards policy and technology issues. The ICSP has working groups on AI, advanced communications, and conformity assessment – each led by NIST. NIST also chairs the Interagency International Cybersecurity Standards Working Group (IICSWG), to coalesce federal agencies around cybersecurity standards issues and needs.

Based on NIST's international standards experience, NIST co-leads our international standards engagements bi-laterally and multi-laterally in partnership with Department of State and the International Trade Administration (ITA). Through the U.S.-EU Trade and Technology Council (TTC) and Quad countries engagements, NIST is increasing coordination in emerging technologies such as advanced manufacturing, AI, and cybersecurity, and working to build support for the U.S. candidate nominated for ITU Secretary-General, a position currently held by a Chinese national. In the Ottawa 5 Digital Standards Working Group, NIST coordinates with Australia, Canada, New Zealand, and the United Kingdom on cybersecurity standardization issues.

To ensure federal agencies have the information they need to be effective in international standards, NIST, in partnership with ITA and the State Department, publishes a monthly "international standards alert" newsletter with over 1300 U.S. government subscribers and is developing standards landscape scans on critical technology sectors such as biotechnology, and the Internet of Things. As mandated by the 2021 National Defense Authorization Act (NDAA), NIST funded a study and report on China's influence in international technology standards. NIST expects the third-party contractor to transmit the report to Congress by the January 1, 2023, due date. To give U.S. stakeholders an opportunity to express their views on this important topic, NIST published a Request for Information (RFI) seeking input on the questions posed in the NDAA. The RFI was published on November 4, 2021, and the 40 responses received were posted to regulations.gov.

An Effective Convener

NIST carries technical expertise, including insights gleaned from convening stakeholders to develop frameworks and guidance into international standards development for a to address emerging technical needs. NIST is currently convening stakeholders to catalyze standards

development to meet national priorities in AI and quantum information science, a reflection of the NIST philosophy of working closely with the private sector and looking to private sector-led voluntary consensus standards to meet government needs. NIST's forthcoming AI Risk Management Framework will address the need to better manage risks to individuals, organizations, and society associated with AI. Under the National Quantum Initiative Act[4], NIST facilitated the establishment of the Quantum Economic Development Consortium (QED-C) to address technology, standards and workforce gaps necessary for a vibrant U.S. quantum industry. In each case, NIST's goal is to accelerate the bringing together of a broad set of stakeholders to address a critical technology challenge.

The Federal government's convener role enables clear communication of Federal government priorities, including national security and the ever-growing impact of technology on our society. The role also helps stakeholder groups to rapidly identify the state of the relevant technology, including existing standards strengths as well as gaps. These models have enabled the U.S. to clearly establish an international leadership role. In the case of AI, NIST's efforts answer a direction from Congress[5] for NIST to develop the risk management framework, and also forms part of NIST's response to the Executive Order on Maintaining American Leadership in AI[6]. In the case of quantum information science, NIST's work to establish the QED-C is part of the Federal strategy for advancing quantum information science as mandated by the National Quantum Initiative Act of 2018 (PL 115-368).

Standards as Technical Barriers to Trade

With the trend toward global tariff reduction, the use of standards and conformity assessment procedures as technical barriers to trade has become an issue of increasing concern. Within the Federal government, the Office of the U.S. Trade Representative (USTR) coordinates the development of U.S. positions and responses on technical barriers to trade-related matters and publishes an annual report on technical barriers to trade. NIST staff provides technical expertise in direct support of trade negotiations.

In addition, NIST supports U.S. industry and government agencies in their efforts to address technical barriers to trade by informing U.S. stakeholders of potential issues related to technical barriers to trade, and helping stakeholders address these barriers. All signatories to the World Trade Organization (WTO) Technical Barriers to Trade (TBT) Agreement are required to establish a national Inquiry Point and Notification Authority to gather and efficiently distribute trade-related regulatory, standards and conformity assessment information to the WTO Member community. NIST serves those roles for the United States.

Notify U.S. – An Early Warning Tool

[4] Public Law No 115-368

[5] https://www.congress.gov/116/crpt/hrpt455/CRPT-116hrpt455.pdf

[6] https://www.nist.gov/news-events/news/2019/02/nist-and-executive-order-maintaining-american-leadership-artificial

Pursuant to the statute[7] formalizing the U.S. implementation of its obligations under the WTO TBT Agreement to provide information to other WTO Members, NIST houses the national Standards Information Center and the U.S. Inquiry Point. The Standards Information Center serves as the U.S. source for standards and standards-related information at home and abroad. The Center processes over 350 standards and conformity assessment related requests each year. The Center also provides bibliographic information on U.S., foreign, regional, and international voluntary standards, mandatory government regulations, and conformity assessment procedures for nonagricultural products. NIST notifies WTO members of proposed regulatory actions and provides comments on the proposed regulations of other members. During FY2021, the Inquiry Point processed over 250 comments from U.S. stakeholders on other members' notifications and shared nearly 4000 total notifications with U.S. stakeholders through its subscription application, NotifyUS. Users of the NotifyUS application, particularly small and medium-sized enterprises with limited resources to track developments around the world, have mentioned that they find significant value in NotifyUS, which provides them a one-stop shop for information on proposed rules, regulations, or procedures that can impact their business opportunities overseas.

Technical Exchanges

NIST engages in information exchanges relating to technical standards and conformity assessment systems with trading partners such as the European Union, Japan, India, and Brazil, among others. These exchanges enable NIST to gather firsthand information about standards and related developments, including technical regulations that can impact American companies exporting to those countries. In instances where NIST has better approaches, NIST has been able to share our experiences about these approaches, why they have worked, and the lessons learned.

Continued dialog with our international partners over the years has generated a significant level of trust, which has resulted in some NIST work products being used in these countries as is, or with minor modifications, further benefiting American exporters. NIST's Cybersecurity Framework has been translated into eight languages, referenced by seven countries, and become the basis for an international standard. NIST's growing leadership in international technology standards and historic global leadership in measurement standards provide NIST with the platform to influence the future of technology innovation around the world, strengthening U.S. competitiveness, safety, and security.

Accelerating U.S. Standards Leadership

Invigorating U.S. standards leadership leads to increased participation and influence in the standards that define the markets of the future. Working with the private-sector NIST can: 1) coordinate policy and regulations to create an environment that facilitates U.S. private and public sector engagement and influence in international standards; 2) ensure that the United States continues to be a welcoming location for hosting international standards events; 3) reduce barriers to standards participation for U.S. industry, especially small and medium-sized

[7] Trade Agreements Act of 1979 (as amended) and 19 USC 13 § 2544

innovators; and 4) facilitate professional development in standards setting through training, education and mentorship programs.

Issues around a standards savvy workforce and tools needed to develop and retain such a workforce remain a challenge. NIST also needs industry and academic leadership to reinvest in the art and science of standards development, as well as the development of the professionals to execute this mission.

In closing, Chairwoman Stevens, Ranking Member Feenstra, and members of the Subcommittee, NIST is actively engaged in standards and standardization. While there are many challenges confronting our engagement, NIST is actively working with our private sector partners to address these challenges using a range of tools, and to leverage the opportunities to help our industries maintain their leadership roles. I look forward to working closely with you, and I will be glad to answer any questions that you may have.

James K. Olthoff (Fed)
Performing the non-exclusive functions and duties of the Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

Dr. Olthoff currently is performing the non-exclusive functions and duties of the Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology. In this role, Dr. Olthoff provides high-level oversight and direction for NIST.

Prior to taking on this role, Dr. Olthoff was the Associate Director for Laboratory Programs. He provided direction and operational guidance for all of NIST's scientific and technical laboratory programs, and served as principal deputy to the Under Secretary of Commerce for Standards and Technology and NIST Director, among other duties. He held that position starting in 2018.

Previously, Dr. Olthoff served as the Director of Physical Measurement Laboratory (PML) where he was responsible for the maintenance, development, and dissemination of the U.S. national measurement standards system, and oversaw NIST's world-class programs in quantum computing, neuromorphic computing, and quantum measurement standards. He also directed the full suite of NIST calibration services in dimensional, electromagnetic, ionizing radiation, mechanical, optical, thermodynamic, and time and frequency metrology.

Dr. Olthoff joined NIST (then the National Bureau of Standards) as a Research Physicist in the Applied Electrical Measurements Group in 1987. In 2014, he was named Director of the Physical Measurement Laboratory after having served four years as PML's Deputy Director. Prior to his appointment to PML, Dr. Olthoff served as Deputy Laboratory Director of NIST's Electronics and Electrical Engineering Laboratory (2007-2010), Division Chief of the Quantum Electrical Metrology Division (2003-2007), Division Chief of the Electricity Division (2000-2003), and in several supervisory and research positions.

Dr. Olthoff received his undergraduate degrees in physics and mathematics from Calvin College in 1980, and his Ph.D. in physics from the University of Maryland in 1985 in atomic, molecular and optical physics. He then held a two-year appointment at the Johns Hopkins School of Medicine before arriving at NIST. During his research career, Dr. Olthoff authored or co-authored more than 120 publications and co-authored or edited four books.

In his role in leading the U.S. measurement infrastructure, Dr. Olthoff has filled high-profile positions representing NIST and the United States within the international metrology community. Currently, Dr. Olthoff is the U.S. representative and vice-president of the International Committee on Weights and Measures (CIPM) which oversees the International

System (SI) of Units. Dr. Olthoff's previous international metrology responsibilities include serving as the Chair of the Sistema Interamericano de Metrologia (SIM) Quality System Task Force (QSTF), representing SIM on the Joint Committee of the Regional Metrology Organizations (JCRB), serving as the Chair of the Conference on Precision Electromagnetic Measurements, representing NIST on the CIPM Consultative Committee on Electricity and Magnetism, and representing the U.S. on the SIM Council and SIM General Assembly. Dr. Olthoff also served as the President of the Board of the NCSL International, the U.S. representative to IMEKO, and the SIM Technical Committee Chair.