

**U.S. GOVERNMENT NATIONAL
STANDARDS STRATEGY FOR CRITICAL
AND EMERGING TECHNOLOGIES
(USG NSSCET):**

IMPLEMENTATION ROADMAP

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1.0 EXECUTIVE SUMMARY

The ability of the United States to sustain a position of global technological leadership is directly related to sustained strategic and tactical U.S. engagement in standards for critical and emerging technologies (CETs). The United States' approach of leveraging the contributions of private sector innovators and government supported research and development has fueled competitiveness and technological progress to the benefit of the U.S. and global economy. These contributions have also ensured strong and impactful technical contributions to standards. The U.S. standardization system is a decentralized, bottom up, sector-based approach led by the private sector to develop market-driven, voluntary, consensus-based standards. The U.S. Government (USG) supports this system by participating in the standards development process, alongside other sectoral representatives from industry, academia, and civil society. The private sector-led model for standardization has demonstrated its effectiveness and adaptability for over a century, proving to be a robust framework that responds well to the evolving markets and national priorities. The USG's unique roles in protecting and supporting national economic security, and other factors such as safety and interoperability, drive the need for comprehensive action including bolstering support for pre-commercial standards development for CET. Enhancing coordination of U.S. private sector and USG engagement in standards for CET will strengthen our economic and national security in the dynamic global landscape.

This document provides immediate and long-term actions for the USG to reinforce its support for the private sector-led system and work in partnership with private sector stakeholders to address opportunities and challenges related to standards development activities for CET.

The Implementation Roadmap facilitates a comprehensive approach to CET standards coordination within the USG and coordinated engagement with USG stakeholders operating in the framework of a private sector-led system. These efforts recognize that the domestic standards systems is private sector-led, operating in an increasingly complex and dynamic international standards landscape that is rapidly evolving, with attendant implications for U.S. national and economic security.

In the short-term, the USG will take immediate action, to include but not limited to: identifying opportunities to increase USG pre-standardization R&D and standards participation efforts; tracking and evaluating current USG CET standards education grants and programs that promote, foster, and remove barriers to U.S. stakeholder participation in national and international standards activities; and tracking and evaluating current USG technology cooperation agreements, international mechanisms for standards-related communication and cooperation.

For long-term sustained implementation outcomes, the USG: (1) enhance standards coordination across the federal government; (2) enhance standards coordination with the private sector; (3) enhance standards policy coordination between the USG and foreign governments; (4) recognize and incentivize federal agency engagement in standardization; (5) provide strong and sustained funding for CET R&D and pre-standardization coordination; (6) engage academia as a critical partner with the private sector in standards development efforts; (7) enhance educational efforts in standards; (8) develop and sustain communications about standards; and (9) remove barriers to participation in standardization. The U.S. Government recognizes multiple private sector efforts related to standards awareness, capacity building, education, bringing in new talent, etc. and will cooperate with the private sector as it pursues its own efforts to minimize duplication, contradictory messaging and maximize the impact of such activities.

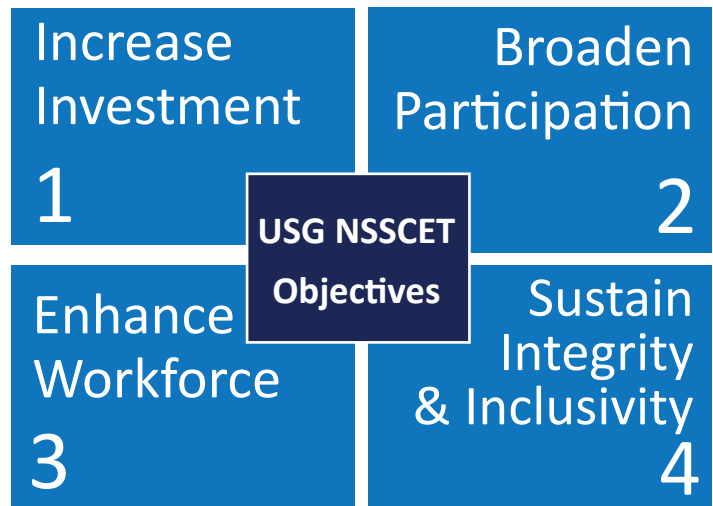
2.0 OVERVIEW OF THE STRATEGY AND IMPLEMENTATION ROADMAP

The USG NSSCET sets forth a vision for how the USG can *increase investment in pre-standards development activities for CETs, broaden CET standards participation, grow a CET standards-savvy workforce, and ensure inclusivity and integrity* in developing CET standards by working with stakeholders. The USG NSSCET¹ raises the profile of CET standards development, sustains the USG’s commitment to the private sector-led, public-private partnership model of standardization, and identifies CET standards as a key component to U.S. national and economic security.

The USG NSSCET complements the United States Standards Strategy (USSS) published by the American National Standards Institute (ANSI)² and supports, complements, and further communicates USG priorities for CET standards development. It signals a broad emphasis across the government aimed at strengthening U.S. competitiveness, innovation, national and economic security via standards-related policies and actions.

This Implementation Roadmap is intended to operationalize the four objectives and eight Lines of Effort (LOE) spelled out by the USG NSSCET. The scope of the Roadmap defines U.S. Government (USG) implementation actions and does not extend to private-sector standardization, however, implementation of the Roadmap requires extensive and sustained coordination with the U.S. private sector. It describes near-term actions and longer-term outcomes in order to prioritize, focus, and better coordinate the USG’s CET-related investments and actions. This Roadmap calls on U.S. Departments and Agencies to take stock of their current CET-related standards activities and plans to re-focus and recommit to working with stakeholders to improve both their effectiveness and efficiency.

Actions and outcomes spelled out in this roadmap will facilitate a thoughtful approach to CET standards coordination and engagement by USG stakeholders operating in the framework of a private sector-led system that is part of a dynamic international standards landscape with attendant implications for U.S. national and economic security.



The U.S. Government is committed to standards development processes built on transparency, the strength of the long-standing public private partnership, and stakeholder engagement that reflects the U.S. commitment to free and fair market competition in which the best technologies come to market.

¹ United States Government National Standards Strategy for Critical and Emerging Technology (<https://www.whitehouse.gov/wp-content/uploads/2023/05/US-Gov-National-Standards-Strategy-2023.pdf>)

² United States Standards Strategy (USSS) (<https://share.ansi.org/Shared%20Documents/Standards%20Activities/NSSC/USSS-2020/USSS-2020-Edition.pdf>)

The USG NSSCET supports a private sector-led system that enhances U.S. leadership in international fora. The four objectives cited above are further defined by and organized around eight Lines of Effort (LOEs):

1. Increase R&D funding to ensure a strong foundation for future standards development.
2. Support the development of standards that address risk, security, and resilience.
3. Remove and prevent barriers to private sector participation in standards development.
4. Improve communications between public and private sectors on standards.
5. Enhance USG and like-minded nations' representation and influence in international standards governance and leadership.
6. Promote the education and empowerment of a new standards workforce with intention to include those underserved in the international standards system.
7. Deepen standards cooperation with allies and partners to support a robust standards governance process.
8. Facilitate broad representation in standards development.

3.0 BACKGROUND ON THE STRATEGY AND THE IMPLEMENTATION ROADMAP

The United States is a highly diversified society with a market driven economy, and its standards system reflects this diversity, encompassing multiple and varied standards sources. The system produces standards that are consistent with the principles of the World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT) and the WTO TBT Committee Decision on international standards. The U.S. standards system promotes the public good, elevates national health and safety, drives innovation and U.S. competitiveness, and contributes to a fairer and more liberalized global trading system. The public and private sectors provide the people, resources, technical contributions, and intellectual vitality that underpin the U.S. standards system.

Government engagement in the U.S. standards system varies widely depending upon individual agencies' missions and functions. Roles include those of user, specifier, participant, facilitator, advocate, technical advisor/leader, convener and source of funding. Agencies at every level of government use standards to support regulation and guidance, procurement and policy activities, as well as incorporate standards into voluntary compliance and certification programs. Government agencies also use standards extensively to provide citizen services, enable connectivity of commercial information technology systems to government systems, and support disbursements of grants, loans, and other similar financial tools and incentives³ (Appendix A).

3.1 Current USG Standards Policy

The USG's standards-related roles and responsibilities and engagement in standards development activities have been clearly scoped, defined, and enshrined in law and policies – notably by the National Technology Transfer and Advancement Act of 1995, Office of Management and Budget Circular A-119, and the Trade Agreements Act of 1979 (as amended) (see Appendix A). A series of statutes, regulations, and administrative orders comprise the legal framework that governs the Federal government's use of standards and its participation in the development and adoption of voluntary consensus standards.

3.2 The Changing International Landscape and a New CET Paradigm

The USG NSSCET follows on earlier actions defining the USG's role in standards development activities. In 2010, the National Science and Technology Council (NSTC) Sub-

committee on Standards (SOS)⁴ was formed to (1) engage government agencies on standards policy issues; (2) articulate the U.S. model of public-private cooperation in standards setting to domestic and international audiences; and (3) increase awareness within the Federal government of best practices in addressing standards policy issues.⁵ This Subcommittee completed its chartered activity at the end of the Obama Administration. However, additional guidance encouraging the Federal Government to engage with the private sector stakeholders early in the process of identifying technology, regulatory, and/or procurement objectives was delivered in White House memo M-12-08⁶ and endorsed in OMB Circular A-119. The Federal Government's engagement should be broad-based, and it should rely on open and transparent processes. The USG NSSCET and this roadmap build on the findings from the SOS and follow on guidance that support, complement, and further communicate USG's strategic priorities for CET standards development. Both are consistent with the ANSI USSS, which remains the predominant statement of purpose and ideals that guides how the U.S. develops standards and participates in international standards-setting processes.⁷

Since the SOS completed, the proliferation of initiatives surrounding CET development and associated standards activities⁸ – especially at the international level – demands the USG reinforce the value of the U.S. model of public-private cooperation in standards to further global innovation and trade. The rapid pace of change of the international technology standards landscape is driving the need for an increased level of coordination between U.S. public and private sector stakeholders to track, engage, and lead standards development that represents the equities of the U.S. Supporting a robust U.S. private sector-led standards

³ Federal Engagement in Standards Activities (https://www.nist.gov/system/files/documents/standardsgov/Federal_Engagement_in_Standards_Activities_October12_final.pdf)

⁴ Charter of the National Science and Technology Council (NSTC) Subcommittee on Standards (SOS) (<https://www.nist.gov/system/files/documents/standardsgov/Approved-Charter-for-Subcommittee-on-Standards.pdf>)

⁵ Federal Engagement in Standards Activities to Address National Priorities (https://www.nist.gov/system/files/documents/standardsgov/Federal_Engagement_in_Standards_Activities_October12_final.pdf)

⁶ https://obamawhitehouse.archives.gov/sites/default/files/omb/memoranda/2012/m-12-08_1.pdf

⁷ United States Standards Strategy (USSS) (<https://share.ansi.org/Shared%20Documents/Standards%20Activities/NSSC/USSS-2020/USSS-2020-Edition.pdf>)

⁸ The European Union, the Blue Guide on the implementation of the product rules (https://single-market-economy.ec.europa.eu/news/blue-guide-implementation-product-rules-2022-published-2022-06-29_en)

⁹ Small yards, big tents: How to build cooperation on critical international standards (<https://www.brookings.edu/articles/small-yards-big-tents-how-to-build-cooperation-on-critical-international-standards/>)

system in the context of the active international landscape for CET standards requires the USG to improve coordination across departments and agencies and enhance its support of, and participation in, CET standardization activities including by expanding support for the involvement of stakeholders from SDOs, industry (including start-ups and small- and medium-sized enterprises), academia, and civil society.

3.2.1 Recognition of CET Impacts on Society in Developing Standards

Coupled with the dynamic nature of CET development, the potential for significant national and economic security implications – including those related to the socio-technical aspects of CET – warrants greater U.S. attention, resources, cooperation, coordination, and participation in national and international CET standardization. Standards activities must take place at the appropriate juncture in technology lifecycles, and building greater awareness of the current state of technology is needed to inform standards engagement as CETs potentially will greatly impact the public interest.⁹ Also, socio-technical considerations have consistently been a part of the research and stan-

dards consideration in areas such as software, privacy, cybersecurity, interoperability, artificial intelligence health-care and sustainability/public health. As an example, the “socio-technical” impacts cited in NIST’s AI Risk Management Framework (AI RMF)¹⁰ characterize AI systems as those influenced by societal dynamics and human behavior which emphasizes the impact on “people and planet” as core considerations for AI risk management. This in turn highlights the importance of a diverse stakeholders’ participation in AI standards development efforts.¹¹

Further, increasing the diversity of participants in the standardization process is vital to fully consider technical as well as larger societal concepts. Additionally, CET standards development requires rigorous and sustained engagement across stakeholder communities at many points in the technology and standards development lifecycles. Working in close partnership with the private sector and standards development organizations to create strategic frameworks and standards development roadmaps for nascent CET areas (such as the additive manufacturing exemplar) is an opportunity for USG engagement and investment.

Additive manufacturing gives U.S. manufacturers a rapid design-to-product capability to make complex, high-value, highly customized parts that are difficult or impossible to make with conventional manufacturing processes. Documentary standards have been developed that help ease adoption of additive manufacturing, many more standards are currently under development in several standards development organizations, and still more are needed. The America Makes & ANSI Additive Manufacturing Standardization Collaborative (AMSC) is a cross-sector coordinating body seeking to accelerate the development of industry-wide additive manufacturing standards and specifications that are consistent, harmonized, and non-contradictory with a Standardization Roadmap for Additive Manufacturing. Approximately 150 public- and private-sector organizations supported the roadmap’s development, including representatives of U.S. federal government agencies and national laboratories, SDOs, industry, academia, and others.

¹⁰ AI Risk Management Framework (AI RMF 1.0) (<https://nvlpubs.nist.gov/nistpubs/ai/NIST.AI.100-1.pdf>)

¹¹ Small yards, big tents: How to build cooperation on critical international standards (<https://www.brookings.edu/articles/small-yards-big-tents-how-to-build-cooperation-on-critical-international-standards/>)

4.0 BROAD THEMES FOR IMPLEMENTATION RECOMMENDED BY STAKEHOLDERS

The information collected via a Request for Information (RFI), stakeholder engagements, consultations, and a subcommittee of the NIST Visiting Committee on Advanced Technology (see Appendix B) pointed to these recommended broad themes for actions by the USG to work with the private sector to effectively implement the USG NSSCET: (1) enhance coordination across the Federal government; (2) enhance coordination with the private sector; (3) enhance coordination with foreign governments; (4) recognize and incentivize Federal agency engagement; (5) provide strong and sustained funding for CET R&D and pre-standardization coordination; (6) engage academia as a critical partner; (7) enhance educational efforts; (8) develop and sustain communications; and (9) remove barriers to participation.

Enhance coordination across the Federal government and seek to ensure that technical regulations, standards, and conformity assessment procedures are based on relevant international standards, guides and recommendations, are non-discriminatory, and do not create unnecessary obstacles to trade. Similarly, adhere to the WTO Agreement on Sanitary and Phytosanitary Measures and ensure the establishment of risk-based national SPS measures consistent with international standards, guidelines and recommendations, and the plurilateral WTO Agreement on Government Procurement, which commits parties to encourage procuring entities to base technical specifications on international standards, where they exist.

Enhance coordination between public and private sectors and work effectively with relevant private sector organizations to support and promote the development and adoption of CET standards, including those critical to national security, public safety, security, health and environmental health and resilience. Encouraging the development of standards for CETs can also help increase and accelerate their implementation and adoption by the private sector.

Enhance coordination with foreign governments and work with likeminded partners and allies to ensure that CET standards support a commitment to free and fair market competition.

Recognize and incentivize Federal agency engagement in CET standardization activities especially where public sector standards support establishes interoperable infrastructure and public system resilience, safety and security, and public and environmental health where there is significant public benefit.

Provide strong and sustained funding for CET R&D and pre-standardization coordination for impactful participation and contributions to standard development. Long-term, sustained investment is a prerequisite for strong and impactful technical contributions to standards. For example, through the CHIPS and Science Act, the U.S. National Science Foundation's Directorate for Technology, Innovation and Partnerships is charged with investing in new pathways for translating research results to practice, and enabling researchers to mature their technological and related innovations to inform standards development constitutes one such pathway.

Engage academia as a critical partner in increasing U.S. engagement in CET standards and training the next generation of standards professionals. Institutions of higher education should renew a commitment to teaching and highlighting the value, development, and use of standards and standardization in a range of career fields.

Enhance educational efforts to explain the return on investment of standards across executive leadership in industry, government, professional and civil society organizations, organized labor, affected communities, and Indigenous rights holders, academia and others to enhance standards engagement and participation across the stakeholder communities.

Develop and sustain communications by taking the following recommended CET-related actions:

- Provide education and awareness for senior leaders in industry, government, academia and civil society and others on the impact of standards on innovation and economic competitiveness as well as the well-being of the American people.

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- Work with stakeholder community to clarify the role of the USG in the national and international standards system and encourage, support and incentivize the use of and participation in voluntary consensus-based development of international technical standards. This is consistent with the U.S. market-driven, private sector-led standards system that is proven to be flexible and swiftly responsive as market needs evolve, producing standards that are fit for purpose.
 - Articulate the value of the standards system to competitiveness, financial security, innovation and sustainability in a range of career fields with institutions of higher education.
 - Work across sectors and organizations to increase knowledge of the critical role of standards in promoting American innovations in the global landscape and offer insights into how to incorporate innovative ideas and novel technology considerations into contributions to international standards development activities.
 - Communicate the impact of standards development activities with Congress to bolster its support for R&D in CET and increase investment in pre-standardization research.
 - Sustain U.S. commitment to innovation, cutting-edge science, and translational research as these remain the drivers of U.S. influence and leadership in international standards development.

Remove barriers to participation by taking the following recommended actions:

- Encourage and support increased foreign participation, by working with SDOs on facilitating foreign visitor travel for U.S.-hosted standards meetings and advocating for increased availability of hybrid participation while complying with ITAR regulations.
- Identify and eliminate senior executives' knowledge gaps of activities in national and international standards bodies and raise awareness about opportunities for technical program leaders in government agencies to support CET standards development.
- Enhance USG participation in standards development activities including where the government is the member such as at the International Telecommunication Union (ITU).
- Make it easier to engage by sharing CET-related standards information and education, and by raising awareness among underrepresented stakeholders, such as start-up companies, consumer representatives, and representatives of civil society.
- Provide opportunities for funding that targets the participation of underrepresented stakeholders, including small- and medium-sized enterprises (SMEs) and start-ups, academia and civil society organizations, organized labor, affected communities, and Indigenous rights holders.
- Enforce antitrust and other relevant laws to remedy anticompetitive and other discriminatory actions in CET related standardization.

5.0 CALL TO ACTION

5.1 Immediate Actions

To date, the U.S. approach to standards development has supported the development of standards that (1) are technically sound; (2) are largely supported by U.S. stakeholders, allies, and likeminded partners; and (3) ease U.S. access to global markets.¹² The U.S. economy and the American people have benefited greatly from this approach. It is essential that the U.S. private- and public-sectors remain fully engaged and cooperate to promote technical solutions — particularly in critical and emerging technology areas. **To accomplish the goals of the USG NSSCET, the USG must continue existing coordination efforts, and should take the following immediate actions when they are compatible with agency and departmental missions, authorities, priorities and applicable law. These immediate actions will inform more effective engagement.**

“ The strategy is a call to action to build on what has made the U.S. approach to standards successful while ensuring that the United States is effectively positioned to address emerging challenges in international standards development. ”

– Laurie Locascio
Under Secretary of Commerce for Standards and Technology,
Director of the National Institute of Standards and Technology (NIST)

U.S. Government engagement in standards activities should be guided by five fundamental strategic objectives as defined by M-12-08:

- Produce timely, effective standards and efficient conformity assessment schemes that are essential to addressing an identified need;
- Achieve cost-efficient, timely, and effective solutions to legitimate regulatory, procurement, and policy objectives;
- Promote standards and standardization systems that promote and sustain innovation and foster competition;
- Enhance U.S. growth and competitiveness and ensure non-discrimination, consistent with international obligations; and
- Facilitate international trade and avoid the creation of unnecessary obstacles to trade.

¹³Standards and Regulations: Measuring the Link to Goods Trade (https://legacy.trade.gov/td/osip/documents/osip_standards_trade_full_paper.pdf)



Objective 1: Investment

- Using annual budget submissions, work with the private sector to identify opportunities to increase CET pre-standardization R&D and standards participation activities – including those consistent with the roles and responsibilities enshrined in law and policies (see Appendix A).
- Identify opportunities to leverage existing budgetary resources related to CET to support greater U.S. participation in national and international standards development activities; support USG engagement through a CET standards coordination platform allowing reports, updates and cross-agency collaboration; provide practical guidance to and departments on how to deploy opportunities for standards engagement and provide access to published standards.

Working with U.S. Department of State Bureau of Cyberspace and Digital Policy, Bureau of Consular Affairs, and NIST, the American National Standards Institute (ANSI) updated its Guidance for United States Visa Application. SDOs are encouraged to send inquires to Businessvisa@state.gov for relevant guidance and communications regarding upcoming U.S.-based SDO conference and meetings. Stakeholders are encouraged to view the latest visa wait times here: <https://travel.state.gov/content/travel/en/us-visas.html>. Going forward, U.S. Departments of State, Commerce, and ANSI will work to facilitate knowledge sharing, practical guidance, direct communication, and promotion of best practices for SDO organizers and participants alike.

Before wireless spectrum access can be standardized in bodies such as the ITU-R, suitable spectrum bands must be located, and interference risk must be measured. This task grows more challenging every year, as spectrum use by commercial and governmental users increases. NTIA's Institute for Telecommunications Sciences (ITS), in collaboration with NTIA's Office of Spectrum Management, the U.S. Department of Defense, and private sector partners, contributes essential radiofrequency propagation research and modeling data to the ITU-R so that standardized spectrum allocations meet both private sector needs and U.S. policy priorities.



Objective 2: Participation

- Track current USG programs that promote, foster, and remove barriers to U.S. CET stakeholder participation in national and international standards developing activities.
- Organize listening session(s) with civil society organizations, organized labor, affected communities, and Indigenous rights holders, and other underrepresented stakeholder groups to foster inclusive engagement across race, gender, age, and other factors.
- Track current participation of Federal experts/liaisons in dynamic standard CET areas to ensure coordination, progress and accountability. Provide mechanisms for agencies to evaluate/report CET priorities, gaps, coordinate engagement, and propose new participation through a collaboration platform.
- Track and prioritize relevant interagency CET technical standards issues and related mechanisms for coordination with the private sector to expand communication, information sharing, and other cooperative efforts between public and private sector CET communities (e.g., industry groups including SMEs, academia, SDOs, and civil society organizations).
- Provide interagency coordination mechanism(s) to track USG implementation of the USG NSSCET, technical standards engagement and associated standards policy issues as well as utilize existing Federal Advisory Committee activities and other advisory bodies to sustain effective coordination with the private sector.
- Sustain an agile approach to participation in standards development organizations (SDOs) to include the full spectrum of public-private collaboration mechanisms, including consideration of formal standards organizations, industry consortia, and open source software.



Objective 3: Workforce

- Define and track current USG CET standards education grants and programs.
- Define and expand access to training opportunities and formalize a standards mentorship program and identify opportunities to develop and promote standards-related competencies, capabilities, and technical expertise within the existing agency workforce and broadening the community of USG standards participants.
- Using annual budget submissions, identify opportunities to develop and promote standards-related curricula with universities and educational institutions that address technical, business, and policy aspects of standards development, with a focus on promoting a future workforce that is “CET standards ready”.
- Identify opportunities to develop and promote standards-related training programs to reduce barriers for professionals currently employed in CET sectors to engage in standards development activities, and to help make this engagement more effective.



Objective 4: Integrity and Inclusivity

- Track current USG extramural funding and science and technology cooperation agreements that support or can be expanded to support national and international standards engagement.
- Using budget submissions, the USG should consider a multi-year investment for the entire lifecycle of standards development from pre-standardization research through publication and adoption including test, certification and conformity assessment.
- Track current international science and technology convening mechanisms to include opportunities for enhanced international standards communication and cooperation with likeminded partners and allies.
- Using annual budget submissions to support identified opportunities to establish international cooperation mechanisms that support robust international standards engagement processes.

Standards Training

Interactive training programs are offered by NIST for federal agency personnel on the fundamentals of standards, conformity assessment, and related topics are including:

- Fundamentals of Standards and Conformity Assessment workshops and seminars are designed for participants to learn the basics of standards, conformity assessment, effective participation in standards development, the role of federal agencies, and other related topics.
- Standards Development Simulations are role playing exercises in which participants negotiate a standard for a fictional, next-generation technology and explore the challenges and opportunities in standards development, focusing on the politics as well as the analytical and practical skills needed to successfully engage in standards negotiations.
- Standards Boot Camp is offered in a small group setting for federal agency personnel to deepen and expand their knowledge of standards and standards development and to better understand the relationships between standards, conformity assessment, measurement, regulation, trade, manufacturing, innovation, and more.

5.2 Actions for Sustained Implementation Outcomes

Implementing the USG NSSCET is a long-term endeavor requiring sustained actions to achieve measurable outcomes. To succeed, the USG must work closely with the private sector stakeholders and likeminded partners and allies to promote the inclusion of all nations and participants in the international standards system. These joint efforts are required to uphold the integrity of international standards development processes – including the principles of transparency, openness, impartiality and consensus, effective-

ness and relevance, and coherence.¹⁴ The USG must build on current coordination to strengthen and sustain departments’ and agencies’ involvement in CET standards development. It must continue to work closely with stakeholders to define opportunities to advance common goals to ensure successful implementation of the strategy.

To accomplish the goals of the USG NSSCET, the USG should take the following long-term actions, consistent with budgetary resources, authorities and applicable law:

Use of the term “Pre-Standardization” is context specific and includes, but is not limited to, the following:

1. Creating and maintaining standardization roadmaps by convening industry, government, academia, and other relevant stakeholders.
2. Purposeful convening to produce seed documents that lay the foundation for standardization, e.g., by convening stakeholders from industry, government, and other entities to structure proposed standards which are then submitted to voluntary standards consensus bodies for development as formal standards.
3. Facilitating broad representation in standards development by convening underrepresented groups to understand their needs, including but not limited to small- and medium-sized enterprises (SMEs), end-users and consumers, civil society organizations, and academia.
4. Information sharing, e.g., via briefing documents or web-based resources describing current standardization activities.
5. Assessing the standardization landscape to identify gaps and needs that will inform research efforts.
6. Engaging industry and other relevant stakeholders to identify and prioritize standardization and related measurement needs, such as by convening stakeholder workshops or developing white papers to inform standardization as well as the foundational metrology needed to realize standards.
7. Directing research to meet or anticipate a specific standardization goal, such as supporting measurement and test methods, performance metrics, validated datasets and tools, frameworks, or other research deliverables to align with the needs of a standard or conformity assessment scheme.

¹⁴ Principles taken from the Decision of the Committee on Principles for the Development of International Standards, Guides and Recommendations, with relation to Articles 2, 5, and Annex 3 of the WTO Agreement on Technical Barriers to Trade, found in G/TBT/1/Rev. 16

OUTCOME 1

Increase investment in CET R&D and standardization to sustain U.S. technical leadership.

Maps to LOE 1: Increase R&D funding to ensure a strong foundation for future standards development.

Maps to LOE 2: Support the development of standards that address risk, security, and resilience.

- 1.1 Sustain funding for CETs and associated pre-standardization R&D to ensure a strong foundation for future standards development. This includes investment in hardening/maturing research results to inform standards development.
- 1.2 Expand and enhance efforts to support private sector stakeholders and standards development organizations in the development and regularly update of strategic standards roadmaps within and across CET categories including high-urgency, high-impact standardization needs.
 - Support convening stakeholders from industry, academia, professional and civil society organizations, organized labor, affected communities, and Indigenous rights holders, standards developers, conformity assessment organizations, and others within and across CET categories to explore opportunities for frameworks to establish strategic standards priorities.
 - Engage in and support private sector stakeholder-led road mapping efforts that build consensus to identify and update strategic standards needs within and across CET communities. Utilize the resulting roadmaps to inform government standards efforts.
 - Develop technical standards frameworks to address risk, security, and resilience and coordinate standards development activities with the private sector and other affected stakeholders.

Department of Defense is working with professional societies to engage with standards work.

A specific example is work of the Defense Systems Working Group of International Council on Systems Engineering (INCOSE) on the updates for ISO/IEC/IEEE 24748-7 and 24748-8.

- 1.3 Expand and enhance efforts to work with private sector stakeholders to develop frameworks to support alignment of standardization for CETs.
 - Support efforts to assess standards readiness for a given technology, which may vary from low levels requiring R&D to develop needed science and engineering principles; to medium levels appropriate for consensus frameworks, best practices, and guidelines efforts; to high levels ready for formal standards processes.
 - Work with private sector stakeholders to assess standards readiness when developing agency approaches to standardization.
 - Coordinate efforts to communicate, value and monitor evolving CET areas and associated standards activities, work with the National Science and Technology Council bodies to maintain CET list, and update stakeholders on changes and revisions to the CET list.
 - Support R&D efforts that provide the foundational science and engineering to advance strategic standards needs from low to high standards readiness levels.

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- 1.4** Expand and enhance efforts to work with private sector stakeholders in standards development for CET industries (including small and medium-sized enterprises), academia, and civil society organizations that support fundamental R&D for CET to:
- inform USG efforts to coordinate support for pre-standardization R&D,
 - foster engagement in standards development,
 - inform USG efforts to coordinate and lead standards development activities across CET areas,
 - track and incentivize participation by Federal R&D grantees and funding recipients working in SDOs and in other standards development activities.
- 1.5** Update proposal and award policies and procedures to explicitly recognize as within scope and to encourage participation in standards activity by Federal R&D grantees and funding recipients and incentivize participation in standards development activities.
- 1.6** Work with the private sector to collect, publish and share case studies and exemplars to articulate examples of standardization stories and interventions.
- 1.7** Consistent with consortia and CET collaboratives (called for in LOE 1 USG NSSCET), create or draw on established communities of practice to define, develop, and promote the adoption of sector-specific standards development activities as critical to national security, public safety, resilience, security, health, and environmental health.
- 1.8** Draw on established communities of practice in sector-specific standards development processes to facilitate adoption of CET standards. ‘
- 1.9** Work with stakeholder organizations including ANSI, standards development organizations, standards setting organizations and consortia, and other associations, to reduce barriers to increased engagement in CET standards development activities by civil society organizations, organized labor, affected communities, and Indigenous rights holders.
- 1.10** Led by the National Science and Technology Council, develop a process for revising and updating the evolving CET list every two years. The USG NSSCET identified several rapidly advancing and dynamic Critical and Emerging Technology areas including: communication and networking technologies, semiconductors and microelectronics, artificial intelligence, biotechnologies, positioning/navigation, digital identity, clean energy, quantum information and other specific CETs for our security and economy such as automated and connected infrastructure, biobanking, cybersecurity and privacy, carbon capture, and critical minerals supply. This implementation roadmap incorporates specific actions for these identified areas and aligns activities with the evolving CET list.

Catalyzing R&D to Standards through Prestandardization Coordination

Quantum Economic Development Consortium (QED-C)

The QED-C works with stakeholders in industry, academia and government to identify and address needs for enabling technology, standards and a workforce to support the emerging quantum-based industry. The consortium provides a coordinated voice for industry to inform and guide federal R&D investment priorities, standards and regulation, as well as workforce education and development. The QED-C was established with support from NIST as part of the National Quantum Initiative (NQI) Act, signed into law in December 2018.

NIST Biosystems and Biomaterials Division (BBD)

BBD is focused on advancing measurement science and technology to accelerate translation and commercialization of emerging biotechnologies, including engineering biology, in support of the bioeconomy. Working with industry and other partners, our multi-disciplinary teams develop metrology and data-driven standards, reference materials, reference data, and protocols by integrating state-of-the-art automation, analytical methods, and ML/AI as platforms for innovation and standardization.

NextG Channel Model Alliance

The NextG Channel Model Alliance (formerly operated as the 5G Millimeter-Wave (mmWave) Channel Model Alliance) is a NIST-sponsored international research consortium working to advance breakthrough measurement, calibration, and channel modeling approaches and technologies used for mmWave and submillimeter-wave frequencies. The Alliance is open to the public and serves to facilitate improved data and knowledge sharing amongst leading communications engineers interested in producing more accurate and predictive channel models and measurements required to support the commercialization of next-generation wireless networks (5G and beyond). The Alliance launched in 2015 and has since grown to include over 300 participants representing over 180 organizations.

Versailles Project on Advanced Materials and Standards (VAMAS)

VAMAS was established following the 1982 Heads of State G7 economic summit held in Versailles. It promotes world trade through innovation and the adoption of advanced materials through international collaborations that provide the technical basis for harmonizing measurement methods. VAMAS's work leads to consensus on best practices and standards. VAMAS participants are typically from the government, metrology institutes, research laboratories, and standards bodies, and the organization is an ideal venue for the multilateral technical discussions and the pre-normative collaboration needed to accelerate international standards development.

Regenerative Medicine and Advanced Therapies (RMAT)

Section 3036 of the 21st Century Cures Act refers to the development of standards for regenerative medicine therapies, including products designated Regenerative Medicine Advanced Therapies (RMATs). In consultation with the National Institute of Standards and Technology (NIST) and stakeholders, FDA is facilitating efforts to coordinate the development of standards for regenerative medicine therapies. Advanced therapies are demonstrating promising clinical efficacy and could change the paradigm for treating a wide range of diseases and injuries.

National Defense Industrial Association (NDIA)

The Cyber Standards Committee is chartered within NDIA for the development of standards being identified, developed, and implemented as part of the cyber protections being put in place by the federal government.

OUTCOME 2

Increase support for Federal programs to remove barriers and promote U.S. stakeholder participation in international standards development.

Maps to LOE 3: Remove and prevent barriers to private sector participation in standards development.

- 2.1** Expand and enhance efforts to support for private sector-led efforts that enhance innovation and strategic cooperation such as:
 - Standards incubators and accelerators that nurture innovative standards ideas, arising from new and continuing contributors, in growing from ideation to mature and successful standards efforts.
 - New and expanded consortia and standards setting organizations focused on consensus strategic priorities and providing a viable path through relevant standards development steps, ranging from best practices and guidelines to de facto standards and, where appropriate, formal consensus standards.
- 2.2** Identify, and where necessary, clarify existing authorities for providing financial support through grants, contracts, and procurements to enable the USG to fund or host meetings of standards setting organizations in the United States and to expand participation in those meetings, especially those addressing CET standards. The USG will take care not to negatively impact the important attributes of the market-driven, decentralized, direct participation models of standards development where there are no intermediaries between the originators of a promising idea and the group of peers developing a best practice or standard.
- 2.3** Expand and enhance efforts to work with the academic community, SMEs, and civil society organizations, organized labor, affected communities, and Indigenous rights holders to understand and remove barriers to their contributions to the private sector-led system for developing CET standards.
- 2.4** Continue to engage with foreign governments to provide balance and efficiency around FRAND licensing.

OUTCOME 3

Enhance coordination across USG departments and agencies to sustain and grow participation in standardization.

Maps to LOE 4: Improve communications between public and private sectors on standards.

- 3.1** Identify, expand and enhance current channels for communication of USG engagement in standards development activities across CETs and evaluate their effectiveness as well as gaps in knowledge sharing.
- 3.2** Develop CET standards committee participation analytics, reports and metrics for USG participants to be updated annually in a robust USG CET standards platform and database. This database and report should include agency, SDO, activity, standards in process and developed, associated technical publications where appropriate, and priority. Each agency should update the database biannually and be accountable for accuracy of meeting the reporting requirement.
- 3.3** Expand and enhance efforts to build partnerships with state, local, and tribal entities to develop CET standards in the delivery of government services.

The National Institute of Standards and Technology (NIST) promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. NIST is charged with coordinating Federal agency implementation of standards and conformity-assessment-related NTTAA provisions. In addition to these responsibilities, NIST also supports:

A public-facing web portal to provide resources and standards information to government, academia, and the public. The Standards Information Center serves as a starting point to identify information on standards, regulations, conformity assessment, and other requirements. The Center helps users navigate a complex U.S. and international standards landscape.

Mutual Recognition Agreements for the Conformity Assessment of Telecommunications Equipment (TEL MRA) - Mutual Recognition Agreements for the Conformity Assessment of Telecommunications Equipment (TEL MRA) are trade facilitating measures that help reduce the time and cost of placing U.S. telecom products in foreign markets by reducing the need for redundant and/or in-country testing and/or certification. The NIST TEL MRA Program team implements the agreements, assisting domestic conformity assessment bodies in obtaining recognition by foreign telecom regulators so U.S. manufacturers can use domestic conformity assessment resources for foreign market access.

USA Enquiry Point for the World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT) - obliges all Parties to maintain an Enquiry Point that is able to answer questions from interested parties and other WTO Members regarding technical regulations, standards developed by government bodies, and conformity assessment procedures, as well as provide relevant documents. The TBT Agreement also requires that WTO Members notify the WTO of certain proposed technical regulations and conformity assessment procedures so interested parties can become acquainted with them and have an opportunity to submit written comments prior to their finalization and entry into force. The enquiry point and notification authority for the United States is operated by the National Institute of Standards and Technology (NIST), an agency within the U.S. Department of Commerce.

Standardization Center of Excellence -A public-private partnership will be established to serve as an effective mechanism for standards-related information and data sharing, purposeful convening opportunities, Communities of Practice, learning programs for standards leaders and executives engaged in decision making, and partnerships to accelerate standardization readiness in selected CETs.

Revitalizing the Standards in Trade (SIT) Workshop Program to provide opportunities for cooperation and information exchange with foreign standards officials on important topics related to standards, conformity assessment, and trade that are vital to the success of U.S. businesses. The knowledge gained provides a basis for increasing trade opportunities in key foreign markets, particularly where such practices differ substantially from those in the United States.

OUTCOME 4

Expand communication, information sharing, and other cooperative efforts between USG and private sector.

Maps to LOE 4: Improve communications between public and private sectors on standards.

Maps to LOE 7: Deepen standards cooperation with allies and partners to support a robust standards governance process.

- 4.1** Expand and enhance efforts to work with private sector standards organizations including SMEs, to develop/or support public and private sector mechanisms for data and information sharing on standards engagement opportunities. These may include standards related information, standards development activities across various SDOs, and how to engage in standards development activities.
- 4.2** Expand and enhance current efforts under the Interagency Committee on Standards Policy to work with stakeholder organizations including ANSI to create CET standards landscapes and assessments that survey, coordinate, and harmonize activities taking place in different organizations (may include areas such as standards ballots/proposals, standards roadmaps, R&D efforts, and events). This work should be informed by Federal Advisory Committees including the Industry Trade Advisory Committees (ITACs) and the NIST VCAT.
- 4.3** Work with likeminded partners and allies to create coordination tools that enable information sharing on public international standards development activities, such as sharing new CET standards proposals to understand technical merit, and best practices and lessons learned in our respective standards systems while simultaneously encouraging open participation in standardization.
- 4.4** In bilateral and multilateral science and technology cooperation agreements, seek to include harmonization of CET research and development efforts that could lead to standards as well as ongoing efforts and plans related to CET standardization and pre-standardization activities.
- 4.5** Enhance efforts and promote standards adoption by the private sector and industry in vertical areas such as healthcare, environment, public health and safety, etc. Promote the value of standards adoption nationwide and incentivize the utilization of standards by industry with different mechanisms and policies. Monitor and track the value and adoption of standards nationwide with metrics and share the results with the public.

OUTCOME 5

Enhance educational efforts to inform current and future standards leaders.

Maps to LOE 6: Educate and empower the new standards workforce.

- 5.1 Support the inclusion of training and educational components, including fellowships and internships, in standardization including USG funded standards incubators and accelerators.
- 5.2 Participate in standards development training and mentorship, including standards leadership courses, to enhance engagement and understanding of the value of standardization to USG and increase participation in CET standards development.
- 5.3 Expand and enhance efforts to work with stakeholders including civil society organizations as well as CET research, development and innovation communities in government, industry, nonprofit, and academia (including the national laboratories and the National Academies) to enhance knowledge of the value of standards development as a fundamental element of the global innovation ecosystem for CET.
- 5.4 Develop and distribute standards excellence awards to create meaningful career recognition and/or compensation incentives for high-quality CET standards work in the USG.
- 5.5 Develop and deliver educational training for small and medium sized enterprises specific to intellectual property rights as they pertain to standards development and implementation.
- 5.6 Collaborate with key entities, such as standards developing organizations, industry professionals, academic institutions, professional societies, and technical and trade schools, to utilize existing educational resources effectively. Expand efforts that can enhance the skills of current participants and provide education for prospective participants in the field.

The U.S. Patent and Trademark Office: Some standards developing organizations (SDOs) provide policies allowing for the incorporation of patented technology in a technical interoperability standard. Often those SDOs seek the widespread and efficient licensing between standards essential patent (SEP) holders and those who seek to implement standardized technologies by requiring licensing on fair, reasonable and non-discriminatory (FRAND), or similar, terms and conditions. FRAND licensing promotes technological innovation, furthers consumer choice, and enables industry competitiveness. This is especially true for emerging technologies and market entry of new and small-to medium-sized entities, whose participation in the standards ecosystem is important to promoting innovation and job creation in today's dynamic marketplace. To support these objectives and the FRAND ecosystem, the USPTO plans to continue to engage with foreign governments to provide balance and efficiency around FRAND licensing.

Sustaining International Engagement and Influence

In July 2024, the Department of State launched a project to support an international standards development process grounded in transparency, private sector leadership and public sector support, and diverse stakeholder engagement. The project will also enhance like-minded nations' representation and an expanded number of countries that are aligned with USG vision, thus creating greater influence and leadership in international standards governance by the United States. In addition, this project will assist participant countries in adopting international standards for domestic policies and laws.

NIST, National Security Agency, Cybersecurity and Infrastructure Security Agency and others work with industry to strategize to meet challenges in the development of secure standards for protecting the cybersecurity landscape.

The Department of Defense engages with allies and partner governments on standards activities through treaty and non-treaty multinational organizations, e.g., the North Atlantic Treaty Organization (NATO). As a member of NATO and other multinational organizations, U.S. government experts routinely engage with personnel from over 70 countries on standardization matters related to national defense requirements, including participation in SDO activities, development of standardization policy and implementing standards to support defense capability and interoperability requirements. Some of these activities are formalized in agreements with national standards bodies (e.g., IEEE, ASTM, ANSI, CENELEC) via Technical Cooperative Agreements.

NIST Standards Coordination Office is working with federal departments and agencies to develop comprehensive Strategic Standards Information Service (SSIS) program. This program provides U.S. Government personnel the means to identify and shape emerging standards in critical areas of U.S. economic, innovation, and national security needs; leverages standardization data to generate insights that inform stakeholder decision points across the interagency; empowers U.S. Government personnel to use standardization data to answer stakeholder concerns; and serves as the premier repository of pre-standards developments across the international system.

OUTCOME 6

Enhance USG and like-minded nations' representation and sustain influence in international standards system.

Maps to LOE 5: Enhance USG and like-minded nations' representation and influence in international standards governance and leadership.

- 6.1** Ensure that USG engagement with like-minded nations in CET standards, including standard essential patents, is robust in the face of a dynamic and evolving international landscape. The USG should ensure government-to-government engagements are informed by consultations with diverse stakeholders and carried out with advance coordination with relevant private sector organizations. Government-to-government efforts are not intended to encourage bloc voting or to pre-determine technical standards outcomes for the global marketplace but to ensure standards engagements promote openness and transparency to reach rules-based consensus, compromise and mutual advantage. CET standards matters will be included in joint goals and agendas, helping to improve communications and collaboration.
- 6.2** Reinforce and sustain the USG's commitment, active leadership, and partnership, for U.S. participation in international CET standards development activities especially in critical in early-stage, precompetitive CET standards development as well as technology interoperability, standards adoption, and conformity assessment schemes.
- 6.3** Study, apply lessons learned, and develop best practices and benchmarks for CET initiatives using experiences of other likeminded partners and allies in standards education and incentives programs.
- 6.4** Engage existing USG talent and capacity building programs (including Presidential Innovation Fellows, Presidential Management Fellows, U.S. Digital Corps, and U.S. Digital Service) critical to CET initiatives to ensure they are aware of standard and conformity assessment schemes as they engage in digital transformation of the USG resources and services.
- 6.5** The United States remains committed to promote [and meet] the World Trade Organization's Agreement on Technical Barriers to Trade standardization principles and the practices and procedures of its Code of Good Practice, through ANSI, the U.S. signatory to the Code.

The technical assistance provided by the U.S. Agency for International Development (USAID) helps low and middle-income countries (LMIC) harness digital technologies to promote economic growth and trade. In standardization for digital technologies, USAID's programs are a key element of the US Government's efforts to align countries' views with the objectives of the National Standards Strategy for Critical and Emerging Technology (NSSCET). This is achieved by enhancing LMIC's recognition of the democratic principles inherent in the international standardization system and by strengthening those countries' abilities to effectively participate in the processes for creating international standards.

OUTCOME 7

Enhance academia engagement providing critical partnerships to sustain the standards innovation ecosystem of the world.

Maps to LOE 8: Facilitate broad representation in standards development.

- 7.1 Provide expanded opportunities for engagement and partnership with educational institutions and the National Academies of Science, Engineering and Medicine to develop and integrate CET standards-related curricula with universities and educational institutions. These efforts should address technical, business, and policy aspects of CET standards development and focus on developing standards skillsets in underrepresented communities, including SMEs, civil society organizations, organized labor, affected communities, and Indigenous rights holders, and global emerging economies.
- 7.2 Partner with professional societies and accreditation bodies to expand and enhance efforts to address accreditation body standards for evaluation and further inform standards-related curricula.

USG and Private Sector must work to foster a deeper understanding of the impact of standards on innovation and economic competitiveness creating greater awareness of the value and processes of creating and implementing technical standards for large and small contributors, potential implementers, and the public.

6.0 ADAPTING AND RESOURCING IMPLEMENTATION

The US NSSCET strategy makes it clear that USG should build on its historic support for the national and international standards system as well as department and agency investments in CET research and development, quality assurance and conformity assessment. The government should use its core competencies of CET subject matter expertise to complement its standards development expertise and leadership to bolster support for the private sector-led standards system of the United States as CET standards are developed and put in place.

The immediate Actions cited in Section 5.1 above should be resourced via existing budgets as part of the USG's support for CET technologies that are vital to U.S. national and economic security. To address the Actions for Sustained Implementation Outcomes cited in Section 5.2 above, it is incumbent upon departments and agencies to develop thoughtful, creative proposals – and explain the value of – additional CET standards funding as part of their work to advance CET technologies, subject to administration requests and Congressional appropriations. All plans for devoting resources to CET standards must be compatible with agency and departmental missions, authorities, priorities and applicable law. Further, they must be based on USG standards statutes and policies as well as the principles in the US NSSCET strategy and the guidance in this implementation roadmap. All plans should be coordinated closely with other CET standards -related efforts by the USG and the private sector.

APPENDIX A: LAWS, REGULATIONS AND POLICIES FOR USG PARTICIPATION IN STANDARDIZATION

Specific laws and regulation define how the USG engages in the international standards system.

A1. National Technology Transfer and Advancement Act of 1995

The National Technology Transfer and Advancement Act (P.L. 104-113 or NTTAA) directs Federal agencies to use technical standards¹⁴“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,” except where inconsistent with applicable law or impractical. The National Institute of Standards and Technology (NIST) is charged with coordinating Federal agency implementation of standards and conformity-assessment-related NTTAA provisions.

A2. OMB Circular A-119

The policies outlined in the Office of Management and Budget Circular A-119 on Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity-Assessment Activities apply to all executive branch departments and agencies, and to independent regulatory agencies. The Circular was last revised in 2016 to reflect the experience gained by U.S. agencies in implementing the Circular since 1998, and concluding and implementing U.S. trade agreements, as well as developments in domestic and international regulatory, standards, and conformity assessment policies. The revisions to Circular A-119 inform agencies of their statutory obligations in standards-setting activities. The Circular directs agencies to use voluntary consensus standards in lieu of government-unique standards except where inconsistent with law or otherwise impractical. It also provides guidance to agencies on participation in the development of voluntary consensus standards and articulates policies relating to the use of standards by Federal agencies.

A3. Trade Agreements Act of 1979 (as amended)

The Trade Agreements Act of 1979 (as amended) prohibits U.S. agencies from engaging in standards-related activities that create unnecessary obstacles to trade and gives the U.S. Trade Representative (USTR) the responsibility to coordinate the consideration of international trade policy issues resulting from, and to develop international trade policy as it relates to, standards and related measures, such as conformity assessment procedures.

A4. How the USG Engages

USG engagement in the U.S. standards system varies widely depending upon individual agencies’ missions and functions. Roles include those of user, specifier, participant, facilitator, advocate, technical advisor/leader, convener, and source of funding. Agencies at every level of government use standards in regulation, for procurement and policy activities, and in voluntary certification programs. Government agencies also use and rely on standards to provide safe and secure financial and other services to citizens. Government agencies also use standards extensively to provide citizen services, enable connectivity of commercial information technology systems to government systems, and support disbursements of grants, loans, and other similar financial tools and incentives.

In instances where the USG acts as a standards user, government agencies and their staff often participate in the development of standards to ensure that specific standards meet their legislative and mission requirements. Competition agencies, primarily the U.S. Department of Justice and the Federal Trade Commission, have an interest in ensuring that private-sector standards setting organizations and associated standards development activities are not used in ways that harm competition, or violate antitrust, intellectual property and/or consumer protection laws. In these instances, the Federal government’s interest goes beyond specific technologies and has a focus on private-sector competitive behavior.

¹⁵ http://standards.gov/standards_gov/nttaa.cfm