ASCET
CENTER OF EXCELLENCE

ADVANCING STANDARDIZATION FOR
CRITICAL AND EMERGING TECHNOLOGIES

Standardization Workshop Summary

MAY 14-15, 2025

ASCET.COM

Foreword

Dr. Mohsen Seifi
Principal Investigator, ASCET CoE

Vice President, Global Advanced Manufacturing Programs, ASTM International

The release of this inaugural report marks a defining moment for the Advancing Standardization for Critical and Emerging Technologies (ASCET) Center of Excellence (CoE). Established in early 2025 through a cooperative agreement with the National Institute of Standards and Technology (NIST) and led by ASTM International alongside a coalition of leading standards organizations, ASCET was created to meet a national imperative: to ensure the United States leads—not follows—in shaping the global standards that will define the technologies of the future.

The world is entering an era where leadership in areas such as artificial intelligence, quantum computing, semiconductors and microelectronics, and biotechnology will determine economic strength, national security, and global influence. In this race, standards are not merely technical agreements—they are strategic assets. They determine the rules of engagement, unlock market access, accelerate commercialization, and safeguard trust. If others set these rules, the U.S. risks diminished influence, slower innovation adoption, and heightened vulnerabilities in critical sectors.

This first workshop brought together nearly 200 leaders from across industry, government, academia, and the standards community to chart a path forward. The discussions captured in this report reflect a shared recognition that the challenge is urgent, the stakes are high, and the opportunity is unprecedented. Establishing U.S. leadership in CET standardization will require bold action: deep cross-sector collaboration, inclusive engagement that brings in new voices, agile processes that keep pace with rapid innovation, and an unwavering commitment to long-term impact.

ASCET's mission is clear—to convene, coordinate, and catalyze. The Center will develop technology-specific roadmaps, strengthen and diversify the standards workforce, build transparent and accessible information hubs, and launch collaborative pilot programs that validate and accelerate the adoption of CET standards. This is about setting the global pace—ensuring that emerging technology standards embody U.S. values, reflect the best of its innovation ecosystem, and position the nation to shape the future rather than adapt to it.

This report is both a chronicle of our starting point and a rallying call. Every stakeholder—whether a global leader, emerging innovator, or policy influencer—has a role to play in building a standards framework that matches the ambition, scale, and speed of the technologies it serves. The work begins now, and the world will be watching.

Executive Summary

The Advancing Standardization for Critical and Emerging Technologies (ASCET) Center of Excellence launched in early 2025 by ASTM international under a Cooperative Agreement with the National Institute of Standards and Technology (NIST), as part of NIST's 2024 funding opportunity (2024-NIST-SCOE-01) to establish a Standardization Center of Excellence (SCoE). The Center was created to support U.S. engagement in international standardization for critical and emerging technologies (CETs) that are essential to national security and economic competitiveness. In alignment with the original intent outlined in the Notice of Funding Opportunity (NOFO), the ASCET Center of Excellence is initially focused on five critical and emerging technologies: artificial intelligence (AI), quantum computing, next-generation communication[1], semiconductors and microelectronics, and biotechnologies. These represent a subset prioritized by NIST from a broader set of 17 CETs previously identified by the federal government as essential to U.S. competitiveness and national security. The Center is led by ASTM International in collaboration with key partners including A3, ANSI, ASME, CSA Group, IEEE, and UL Standards & Engagement.

The Center's inaugural workshop, held in May 2025, served as a foundational step in shaping ASCET's direction, bringing together nearly 200 stakeholders from industry, academia, standards development organizations (SDOs), implementing partners, and government. Participants gathered to explore the Center's mission and strategic vision, begin to identify key gaps and barriers in CET standardization, examine collaborative models and tools, and build momentum for sustained engagement and coordination across the CET ecosystem.

Day 1 featured insights from government and industry leaders:

- **Government speakers** emphasized the importance of early engagement, workforce development, and standards as tools for innovation, regulation, and national security.
- **Industry speakers** highlighted challenges such as cybersecurity, interoperability, and regulatory uncertainty, and called for agile, industry-led standardization processes.
- An **expert panel** of five individuals active in standards processes shared their experience and lessons learned on how to most effectively engage in standards development and accelerate progress.

[1] Following the workshop, NIST refined the list of highest priority CETs to include AI, quantum computing, semiconductors and microelectronics, and biotechnology.

Executive Summary

Day 2 focused on interactive breakout sessions aligned with the Center's four foundational topic areas:

1. Pre-standardization Engagement
2. Workforce Capacity Building
3. Information and Data Sharing
4. Collaborative Pilot Programs

Several overarching themes surfaced at ASCET's first workshop that cut across all topic areas and stakeholder groups:

- **Standardization must include diverse voices:** Effective standardization requires engagement from a broad variety of stakeholders, including small- and medium-sized enterprises (SMEs), underrepresented groups, and non-traditional contributors. Mapping the CET ecosystem and reducing barriers to entry are essential for ensuring inclusive representation.
- **A strong workforce is essential for long-term success:** Developing a robust pipeline of standards professionals is essential to sustaining long-term leadership in CETs, and is achievable by embedding standards education into undergraduate programs, expanding access to mentorship and training opportunities, and fostering continuous engagement throughout professionals' careers.
- **Access to information must be centralized and transparent:** Participants emphasized the need for accessible, centralized repositories of standards-related information (such as terminology, best practices, and ongoing activities) to improve transparency, reduce duplication, and foster collaboration.
- **Pilot programs must bridge the gaps between innovation and implementation:** Real-world testing environments are not just about validation—they are critical for aligning standards with operational reality, surfacing interoperability challenges, and accelerating the transition from prototype to scalable deployment. These pilots also foster collaboration across sectors and help build trust in emerging technologies.
- **Standards processes must evolve with technology:** Keeping pace with the rapid advancement of CETs requires agile standards development processes. Flexible, iterative, and adaptive approaches can help ensure standards remain relevant and effective.

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SUMMARY OF NEXT STEPS

The workshop produced several actionable recommendations, with the following high-level next steps serving as a guide for the Center's future roadmapping and coordination efforts detailed throughout the report:

- **Develop CET-specific roadmaps:** Create tailored roadmaps for each priority CET to identify standardization gaps, prioritize actions, and convene inclusive stakeholder groups.
- **Launch workforce development initiatives:** Implement training programs, mentorship models, and standards bootcamps to prepare professionals at all career stages for active participation in standards development.
- **Create centralized information hubs:** Build and maintain searchable, open-access repositories of standards resources, including terminology databases, self-reporting contributor registries, best practices, and ecosystem-wide activity trackers.
- **Facilitate collaborative pilot programs:** Establish secure, cross-sector environments for testing CET standards, with support from NIST and other agencies to streamline market adoption.

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Background

In early 2025, ASTM International launched the Standardization Center of Excellence (SCoE) for Critical and Emerging Technologies (CETs), now known as the ASCET (Advancing Standardization for Critical and Emerging Technologies) Center of Excellence, as part of a Cooperative Agreement with the National Institute of Standards and Technology (NIST)—a transformative initiative aimed at supporting private sector-driven U.S. engagement and capacity building in the development and use of international standardization. The Center of Excellence supports private sector-driven engagement and capacity building by fostering collaboration across industry, academia, standards development organizations (SDOs), implementing partners, and government.

As part of this effort, the inaugural CET Standardization Workshop was held on May 14–15, 2025, in Bethesda, Maryland. The workshop convened a diverse group of stakeholders—including technical experts, policy leaders, educators, and implementers—to share insights on the current state of CET standardization, identify key challenges, and explore opportunities for coordinated action.

The workshop was structured around four foundational topic areas: **Pre-standardization Engagement, Workforce Capacity Building, Information and Data Sharing,** and **Collaborative Pilot Programs.** The first day featured presentations and panel discussions from industry, government, and standards leaders, setting the stage for the second day's breakout sessions. Through these breakout sessions, participants responded to the central question: What specific standards activities are essential to accelerate progress and establish U.S. leadership in CETs? The discussions generated a rich set of recommendations and priority actions aligned with each topic area.

Key objectives of the workshop included:

- Introducing the Center's mission of enhancing U.S. leadership in international standardization.
- Identifying standards gaps and participation barriers within existing CETs.
- Highlighting tools and resources that can support U.S. engagement in international standards development.

The insights captured during the workshop will inform the Center's ongoing roadmap development and serve as a foundation for future coordination across the CET standards ecosystem.

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Background

DOCUMENT STRUCTURE

This document is a draft summary and aggregation of results from the workshop discussions, intended to capture key themes, insights, and actionable recommendations that emerged across all sessions. It was developed using information shared during the two-day workshop, as captured in notes and presented in PowerPoint slides. It is **not** a verbatim transcript.

Each section is structured around the flow of the workshop sessions. For example, real-time polling of participants is integrated into the appropriate sections to capture relevant information in one place. The results of all workshop polling data are summarized in Appendix A.

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Workshop Summary Day 1: Speakers and Panelists

The first day of the workshop included hearing from key groups with a role in standardization for CETs: industry, government, academia, standards development organizations, and implementing partners. It included a mix of presentations, discussion, and Q&A intended to provide insight into the current landscape, challenges and opportunities, and the role that the Center of Excellence can play in meeting the objective of advancing U.S. leadership in international standardization for CETs.

Opening Remarks

Dr. Shyam Sunder is the Associate Director of Laboratory Programs (ADLP) at the National Institute of Standards and Technology (NIST) within the U.S. Department of Commerce. In this capacity, he provides strategic direction and operational guidance for all NIST's scientific and technical laboratory programs. Dr. Sunder provided recorded remarks to open the workshop.

During his remarks, Dr. Sunder said NIST has an ongoing commitment to advance U.S. leadership in standardization for CETs. As such, NIST is authorized to support infrastructure that removes and prevent barriers to private sector participation in standards development, improve communication between public and private sector stakeholders, and enhance U.S. and like-minded nations representation and influence in international standards governance and leadership.

The Center of Excellence is intended to leverage the work of the private sector, academia, NIST, and other government agencies through meaningful and impactful collaboration and partnerships. Ultimately, the goal is for the Center of Excellence to be a self-sustaining, permanent resource for increasing U.S. participation in international standardization for CETs.

"Today's workshop is a vital first step for accomplishing this long-term vision for the Center," Dr. Sunder said.

Dr. Sunder emphasized the need for increased coordination between the public and private sectors, noting that the best standards are made with broad participation to drive consensus from all interested stakeholders. But active participation in standardization requires significant time and resource commitments that can be difficult, especially for small and medium-sized enterprises.

"Your insights, experience, and collaboration are essential to the success of this effort. Today, you will help us refine our objectives, shape our tasks, and determine the most effective path forward by identifying gaps, breaking down barriers to participation, and identifying the tools and strategies that will have the greatest impact," Dr. Sunder said.

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Andy Kireta is the president of ASTM International. He most recently served as president & CEO of the Copper Development Association (CDA), a not-for-profit trade association that serves as the world's foremost resource on copper and copper alloy applications.

Mr. Kireta also provided opening remarks and noted the robust response to the workshop and interest in the Center. He also emphasized the importance of collaboration for advancing the Center's objectives. Mr. Kireta discussed the need to identify existing activities and work to fill gaps to ensure maximum impact. The Center presents an opportunity to introduce audiences unfamiliar with standardization and encourage new stakeholders to seek standards to support innovation.

VISION TO ACTION: LAUNCHING THE SCOE FOR CETS

Dr. Mohsen Seifi is the Vice President of Global Advanced Manufacturing Programs for ASTM International and has more than 13 years of experience in advanced manufacturing and business development.

Dr. Seifi presented an overview of the Standardization Center of Excellence for Critical and Emerging Technologies, now known as ASCET—Advancing Standardization for Critical and Emerging Technologies—Center of Excellence. He said the launch of the Center comes at a pivotal moment for innovation as there is a global race to advance critical and emerging technologies.

Standards are not just technical documents but have become a geopolitical tool that brings the most benefit to those who develop them and shape the market. If the United States does not lead in setting standards for CETs, it will inevitably adopt those set by others, leading to slower commercialization for U.S. innovations, diminished American influence globally, and vulnerabilities in the most mission-critical sectors. Standards are the bedrock of safety and quality, ensuring the reliability of products and services.

Standards accelerate innovation. Innovation without a standards framework may offer an illusion of speed initially, but it often leads to dead ends, fragmented markets, proprietary silos, costly rework, regulatory rejection, and missed opportunities. Innovation built on the foundation of standards may seem more measured at the outset, but then it achieves powerful, exponential growth leading to rapid market adoption, seamless interoperability, increased investment confidence, broader market access, and smoother regulatory pathways.

The ASCET Center of Excellence is envisioned as a facilitator and dedicated convener that actively supports U.S. private sector leadership within existing domestic and global voluntary consensus standards development ecosystems. It is

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Workshop Summary Day 1: Speakers and Panelists

intended to be a long-term national effort that requires sustained and active engagement.

The ASCET Center of Excellence presents the opportunity to strengthen the existing ecosystem, scale up innovation, and bring key stakeholders together.

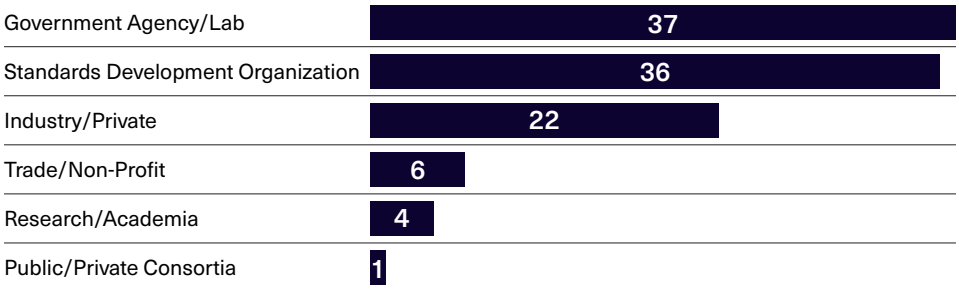
PARTICIPANT POLL: STAKEHOLDER TYPE, LOCATION, AND CET OF INTEREST

During Day 1, workshop participants provided real-time information through online polling. Participation was optional and results do not reflect all participants. See Appendix D for a summary of stakeholder types and complete list of participants.

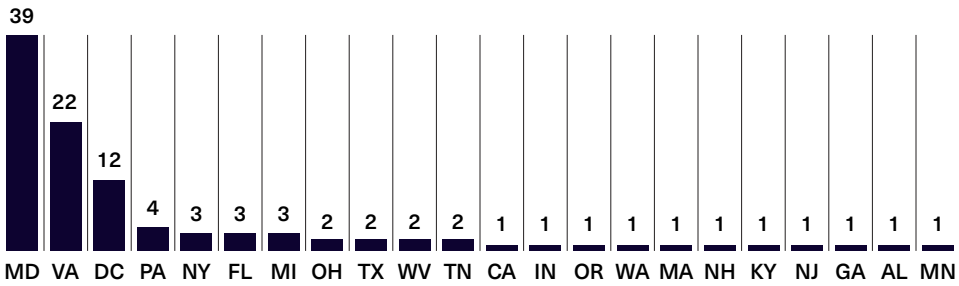
At the start of the workshop, participants were asked to identify what type of stakeholder group they represent and where they traveled from to attend the workshop.

Poll: Stakeholder Types and State of Origin

Stakeholder Types [N=106]



Stakeholders by State [N=105]



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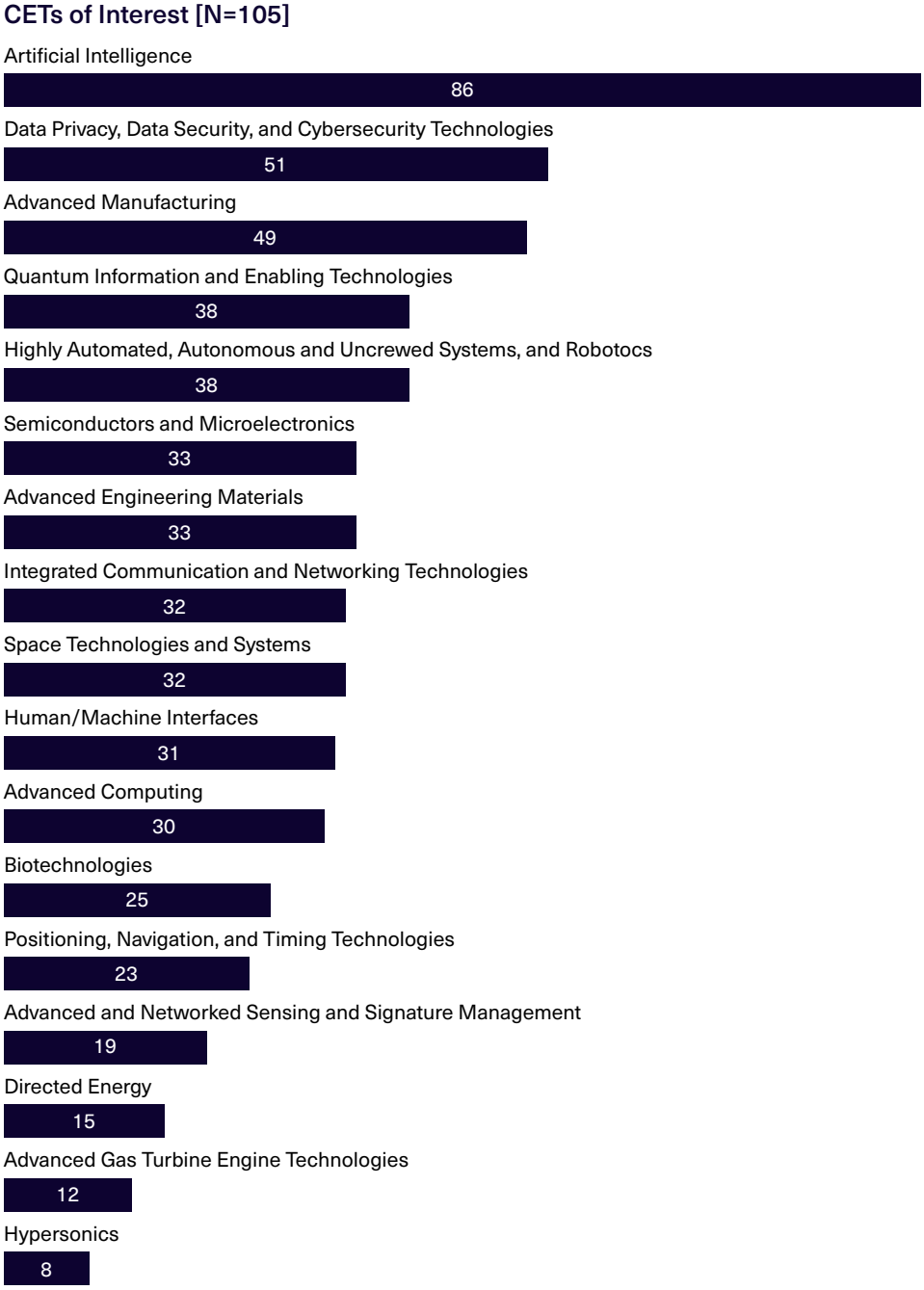
POLL: CETS OF INTEREST

Participants were asked to identify the CETs they were most interested in, with the option to select multiple technologies.



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Government Perspectives on CETs and Needed Standards

Representatives from government agencies shared that, while their missions differ, each is focused on executing critical national priorities. From their perspective, standards to enable the adoption of CETs help them be more successful in their mission. During the discussion, speakers noted that market-driven innovation is enabled by standards, so it is important for early involvement in the standardization process. Workforce capacity building was mentioned as a top priority.

This section includes a summary of the presentations and discussions based on notes and information presented at the workshop.

PARTICIPANT POLL: ROLE OF GOVERNMENT IN CET ADVANCEMENT

The table below includes a summary of responses categorized by theme with specific responses captured.

Themes, Percent of Respondents	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Stakeholder Convening & Engagement 56%	– **Enable cross-sector collaboration** including consensus-building, balanced participation, and international coordination – **Enable participation of SMEs** by funding and supporting their involvement in standards activities – **Participate in standards committees** through drafting/ideating and in leadership roles – **Build public-private partnerships** to foster cooperation and shared responsibility in standards development
Funding Support 46%	– **Increase and sustain funding** for R&D and early-stage pre-standardization – **Provide financial incentives** for organizations and industries to engage in and support standardization activities – **Provide long-term, strategic funding** to build economies of scale and foster market creation
Strategy & Regulatory Policy 29%	– **Set clear priorities and identify needs early,** developing national roadmaps to guide standards development – **Streamline and align regulations to support innovation** including minimizing interferences, cutting red tape, and coordinating across agencies

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Workshop Summary Day 1: Speakers and Panelists

Themes, Percent of Respondents	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Other Responses -	– **Develop the human capital** needed for standards development through education and training programs – **Provide shared resources and technical expertise** including infrastructure – **Promote awareness and participation** in standards through outreach, communication, and advocacy

SPEAKERS AND CURRENT USE OF CETS

Four government representatives provided brief presentations focused on the development and use of standards for CETs, challenges they are facing, and opportunities for acceleration. This section includes a short bio and a brief description of how their agency is currently using CETs.

Dr. Huijuan Dai serves as the Supervisory Program Manager for the Next Generation Materials & Processes Program in the **U.S. Department of Energy (DOE) Advanced Materials and Manufacturing Technologies Office (AMMTO).** Her portfolio includes research, development, and pilot demonstration for technologies that cover smart manufacturing, additive manufacturing, high performance computing, cyber security for manufacturing, composites, highly conductive materials, and materials for harsh service conditions.[1]

Dr. Sheng Lin-Gibson is the Chief of the **NIST** Biosystems and Biomaterials Division. She oversees a multidisciplinary research portfolio that includes regenerative medicine and advanced therapies, precision medicine, synthetic biology, and complex microbial systems. She leads and coordinates the development of global standards for emerging biotechnology and biomanufacturing. [2]

Tim Klein is the Director of Technology Policy and Outreach at the **U.S. Department of Transportation.** In this role within the Office of the Assistant Secretary for Research and Technology, he oversees all external and policy relationships including with the Office of the Secretary, Congress, White House, media, international, and stakeholder activities. [3]

Dr. Cindy Waters is the Senior Science Technology Manager (SSTM), Principal for Advanced Manufacturing and Materials, for Naval Sea Systems Command (NAVSEA) out of **the Naval Surface Warfare Research Center Carderock**. She has decades of research in materials and manufacturing.[4]

LESSONS LEARNED FROM GOVERNMENT USE OF CETS

Government speakers shared some lessons learned from their use of CETs and the role standardization can play.

– **Industry acceptance is essential:** CETs don't always require regulation, but standards for those technologies must be widely accepted to succeed.

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- **Early user engagement is critical:** Involving end users in the standardization process helps align technology with real-world applications.
- **Many CETs are in early TRLs:** New technologies can remain in foundational stages due to commercialization barriers without effective standards.
- **Dual-use risks require foresight:** Strategic risk assessment and mitigation planning are necessary from the outset.
- **Global coordination is needed:** Standards, norms, and regulatory policies—such as those governing export controls and the handling of chemical, biological, radiological, or nuclear (CBRN) materials—must be internationally aligned.

OPPORTUNITIES TO ACCELERATE CET ADVANCEMENT

Government speakers shared the following opportunities to advance standardization of CETs:

- **Engage and convene interested industries and stakeholders** to conduct roadmapping, define performance requirements, and identify "quick win" opportunities.
- **Build a connected ecosystem** by integrating regulatory agencies and standards education into a robust end-to-end system.
- **Offer standards as alternatives to regulation** by educating regulatory bodies on how standards can support policy goals.
- **Advance beyond early research** by evolving consortia efforts to support later-stage development and deployment of standards.
- **Standards enable interoperability and integration** across systems and sectors to ensure seamless technology adoption.
- **Prioritize workforce development** to ensure a pipeline of skilled professionals for CET standardization.
- **Address data security challenges** by recognizing sector-specific needs in data storage and transport.
- **Lower data sharing barriers** by reducing the "activation energy" needed to share process data and material data for AI acceleration.

CHALLENGES IN USING AND ADVANCING CET STANDARDS

Government speakers identified the following challenges:

- **Limited early engagement:** CET standards developers often do not engage "user" industries early enough to understand operational environments and their requirements.

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- **Costly modifications for legacy systems:** CET offerings may require e xpensive adjustments to integrate with existing infrastructure, assuming rapid equipment turnover.
- **Non-interoperable product risks:** Some CET entities pursue closed systems, increasing risk in complex environments.
- **Technical integration issues:** Challenges include scalability, interoperability, reliability, data requirements, and convergence of multiple technologies.
- **Broader risk domains:** Intellectual property, safety, cybersecurity, privacy, and dual-use concerns must be addressed.
- **Additional systemic barriers:** Infrastructure gaps, ethical and social concerns, regulatory uncertainty, and workforce shortages also pose significant challenges.

STANDARDIZATION GAPS AND NEEDS

Building on the discussion about the use, challenges, and opportunities, speakers provided their thoughts on standardization gaps and needs, including:

Identified gaps

- **Data interoperability across platforms:** Lack of common standards for machine data, digital twins, and AI models, resulting in fragmented system architectures that limit cross-platform optimization.
- **Qualification standards for high-performance materials:** No harmonized testing or qualification pathways exist, which slows deployment in critical applications like advanced nuclear and fossil systems.
- **Cybersecurity standards for digital manufacturing:** Current standards are insufficient to protect AI-enabled, connected platforms, thereby increasing the risk of cyber-physical breaches—especially in critical energy infrastructure with legacy operational technology (OT) systems.
- **Testbeds with standards integration:** Few shared environments exist where CET-aligned standards can be piloted and validated at scale, which slows the evolution of technologies into formal standard and weakens U.S. competitiveness.

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Identified needs:

- **Standards to support innovation in regulated industries:** For example, enabling regulatory flexibility through standards-based waivers (e.g., hazardous materials packaging).
- **Performance standards for complementary PNT systems:** Performance standards are needed to ensure resilience and reliability for critical infrastructure owners/operators facing GPS jamming or spoofing threats.

ROLE OF ASCET CENTER OF EXCELLENCE

Government speakers agreed that the Center of Excellence could help address identified gaps and help establish the U.S. as a leader in standardization for CETs. Specific areas that they see as a role for the Center:

- **Focus on partnerships and collaboration** by casting a wide net; building on existing collaborations to advance strategically selected CET standards; and convene cross-sector collaborations to establish durable links between manufacturers, startups, government, and standards bodies to co-develop CET test protocols, benchmarks, and pathways.
- **Embed standards development in real-world testbeds:** Support pilot projects and shared testing environments—such as demonstration sites, simulation platforms, or controlled experimental settings—to integrate standards into early-stage technology pilots.
- **Improve transparency/traceability in standards development:** Support open, accessible mechanisms for tracking who is developing what standards, where, and how they align with CET priorities.
- **Recognize, rely on, and promote the technical results** of the private sector-led U.S. standards system and American innovation to ensure they inform and guide CET standardization efforts.
- **Keep conformity assessment in mind** when advancing CETs.

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Q&A

Below is a summary of additional insights provided during the question-and-answer section.

- **Interoperability and data sharing** require collaboration within and across sectors to ensure systems can work together effectively.
- **Cross-sector standardization example:** Lane markings and break warnings in vehicles took nearly 20 years to standardize. This effort required coordination across vehicle, lighting, and infrastructure standards, and had to account for international infrastructure variances between countries.
- **Consortia as collaboration tools:** The private sector can better collaborate with government through consortia, which serve as a convening force to bring together stakeholders and design studies that build testing competencies and robustness.
- **Traits of successful programs** include a clear shared vision, defined scope, alignment across stakeholders, and strong government coordination.
- **Interim steps before formal standards** may be necessary when technology evolves too quickly. Sharing best practices can help bridge the gap until formal standards are developed.

PARTICIPANT POLLING: TAKEAWAYS FROM GOVERNMENT PERSPECTIVES

The table below includes a summary of responses provided following the government perspectives session categorized under key themes with specific responses captured to elaborate on the point.

Themes	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Cross-Sector Collab. and Coordination	– **Emphasis on need for stronger cross-sector and cross-agency collab.** to address shared challenges and avoid duplication of efforts – **Public-private partnerships essential** for aligning missions, sharing resources, and speeding up joint efforts – **Communication gaps and siloed operations** remain significant barriers to collaborating on standards – **Transparent data** sharing is key for building stakeholder trust

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Themes	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Complexities in Standardization and Interface Management	– **Fragmented, inconsistent, and overlapping standards** are major sources of confusion, inefficiency – **Interface management is a recurring challenge** (i.e., ensuring different standards and systems can work together) – **Integrated, cross-cutting standards must adapt to evolving use cases** to enable the convergence of CETs (e.g., AI, IoT, cybersecurity) – **Need for "fit for purpose" standards** aligned with different technology readiness levels (TRLs) – **Consensus-driven standards development,** while valuable, has not kept pace with CET innovation – **Desire to reference existing standards**—not create new regulations—to streamline CET adoption and provide the tools needed by SDOs and industry – **Need for new, agile approaches to standards development** that maintain quality without sacrificing speed
Accelerated Technology Experimentation and Deployment	– **Accelerating AI technology development** could help all other CET advancement move faster – **U.S. is lagging China in rapid experimentation;** more test beds and pilot programs are needed to validation CETs in real-world environments
Workforce Capacity Building	– **Workforce shortages in CETs** are major concern; this should be a strategic priority for national competitiveness and U.S. leadership – **Universities could create/offer courses/degrees in "standards training"** to support SMEs, ensuring a pipeline of skilled professionals – **Academic engagement and public awareness must enable earlier exposure to standards-related education** to build long-term workforce capacity

Industry Perspectives on CETs and Needed Standards

Representatives from industry shared their perspectives on standardization for CETs, emphasizing the role of standards in enabling innovation, market access, and interoperability. Speakers discussed challenges such as cybersecurity, regulatory uncertainty, and workforce gaps, and highlighted the importance of agile, industry-led standardization processes. They also stressed the need for clearer value propositions, better coordination, and broader participation to accelerate CET adoption.

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This section includes a summary of the presentations and discussions based on notes and information presented at the workshop.

SPEAKERS AND CURRENT USE OF CETs

Six industry representatives provided brief presentations on their development and use of CETs, challenges they are facing, and opportunities for standardization.

Adelina (Addie) Cooke is the Head of AI Policy at **Google Cloud.** She advises Cloud teams on public policy considerations related to new or updated product offerings, strategic technology collaborations, and client interactions. Cooke supports Cloud's AI governance framework, facilitating the incorporation of forthcoming regulatory requirements and industry benchmarks.

Jaydee Griffith is the Managing Director of **ATIS' Next G Alliance**, which is building the foundation for North American leadership in 6G and beyond. Prior to joining ATIS, Griffith was Chief Technologist for the Public Wireless Supply Chain Innovation Fund—the $1.5B federal grant program to advance open, interoperable, and innovative radio access network solutions for 5G and beyond—at the National Telecommunications and Information Administration (NTIA).

Austin Lin works in Silicon Valley and serves as Chair of the **United States National Committee to the ANSI IEC/ISO Joint Technical Committee - Quantum Technologies (JTC 3)** and as the Vice Chair of the Standards and Performance Metrics Technical Advisory Committee of the **Quantum Economic Development Consortium (QED-C).** He is Past President of the American Society for Quality and serves on executive boards with the American Institute of Chemical Engineers (AIChE) and the National Society of Professional Engineers (NSPE).

William (Bill) Lyons is the Senior Executive director of the Enterprise Technology Strategy Organization of **The Boeing Company.** He leads a team responsible for conceiving, planning and developing strategies for technology programs and collaborative R&D that will shape the future of aerospace. Previously, he was the senior director of Global Engineering, managing the global engineering workforce and leading the placement of strategic work at Boeing's engineering centers around the world.

Kristopher Rush is a member of the technical staff in the Computer Emergency Response Team (CERT) Program at **the Software Engineering Institute (SEI) at Carnegie Mellon University.** SEI is a Federally Funded Research and Development Center (FFRDC), a nonprofit, public–private partnership that conducts research for the United States government.

Diya Wynn is a Principal, Responsible AI Lead with **Amazon Web Services.** In this role, she is a champion for ethical, safe, inclusive AI development and empowers organizations to build trust in AI. With over 25 years of experience spanning the internet, e-commerce, social media, mobile, cloud, and now AI, she brings that expertise to her approach to work at the intersection of emerging technology and humanity.

OPPORTUNITIES TO ADVANCE CET STANDARDIZATION

Speakers shared the following ideas for how to advance standardization of CETs:

– **Provide government support** through clear policies intended to advance CET standardization; restore and expand the R&D tax credit to include standards activities; and provide incentives.

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- **Use standards to enable interoperability** and provide flexibility to update or change solutions efficiently as new ones become available. Standards can promote a vendor-agnostic environment, driving competition based on merit, innovation, and value.
- **Conduct modeling and simulation** with digital twins
- **Deploy agile development practices and environments** that support iterative standards development, rapid prototyping, and real-time feedback loops—especially in fast-evolving domains such as AI and quantum technologies. These practices can help ensure that standards remain relevant, adaptable, and aligned with technological advancements and market needs.

CHALLENGES IN ADVANCING STANDARDIZATION OF CETS

During the session, industry speakers identified the following challenges for advancing CET standardization:

- **Cybersecurity vulnerabilities** threaten the safe deployment of CETs.
- **Interoperability limitations** hinder integration across platforms and systems.
- **Supply chain fragility** affects access to critical components and materials.
- **High entry costs** deter smaller players from participating in CET markets.
- **Talent shortages and skills gaps** limit the workforce available for CET deployment.
- **A confusing marketplace** makes it difficult to navigate emerging technologies.
- **Regulatory uncertainty** creates hesitation in investment and deployment.
- **Data-driven decision-making** is hampered by inconsistent or inaccessible data.
- **Decline in R&D leadership and public investment** slows innovation momentum.
- **Underappreciated economic potential** of CETs leads to missed opportunities.
- **Lack of cross-industry collaboration** prevents shared progress and innovation.
- **Legal and regulatory clarity** is needed to support responsible CET use.
- **Bias in systems** must be identified and mitigated to ensure fairness.
- **Privacy and data protection** are essential for public trust and compliance.
- **Intellectual property protection** is critical for innovation incentives.
- **Potential misuse of CETs** must be proactively addressed through safeguards.

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Workshop Summary Day 1: Speakers and Panelists

STANDARDIZATION GAPS AND NEEDS

Industry speakers identified the following gaps and needs in standardization:

- **Reframe standards as a catalyst,** not a barrier for innovation. Rather than positioning standards as a mandatory step, discuss how they add value to technology innovation. It will be important to balance standardization against competitive differentiation.
- **Identify and communicate a clear value proposition** for participating in the standards process.
- **Address technical barriers** such incompatibilities in data formats, storage, API standards, and software frameworks, particularly for platform as a service (PaaS) and software as a service (SaaS) which are often optimized for specific cloud service providers (CSPs).
- **Promote use of standards in public sector procurement solicitations** to increase competition and prevent vendor lock-in and potentially higher costs. Defaulting to open standards-based solutions can promote security, innovation, and efficiency through competition.
- **Develop common taxonomies and frameworks** for testing, evaluation and understanding how to compare different products.
- **Promote adoption of open interoperability standards** to support digital sovereignty and use standards to forge a path that allows sovereign controls over critical data and infrastructure. For example, CET promotion of interoperability standards can ensure that European innovators can build higher-value services and AI models on a standardized, interoperable base, rather than being tied to a single provider.

ROLE OF ASCET CENTER OF EXCELLENCE

Industry speakers identified several roles that the Center of Excellence could play in enhancing U.S. leadership in international standardization for CETs:

- **Promote the economic and societal value of standards:** communicate how standardization drives innovation, market growth, trust, and public benefit—especially to non-standards stakeholders, policymakers, and the future workforce.
- **Foster strategic collaboration with SDOs:** build formal partnerships to align efforts, avoid duplication, and amplify the U.S. voice in global CET standards shaping.
- **Share and scale standards best practices:** develop and disseminate guidance on enabling standardization while accelerating deployment of CETs, supporting interoperability, and fostering economic growth and competitive advantage.

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Workshop Summary Day 1: Speakers and Panelists

- **Foster cross-functional collaboration and education** between technical and acquisition teams on how standards can support architectural plans that address full-stack interoperability, data portability, and machine readability.
- **Identify and leverage existing efforts** to support Center objectives to help move quickly and reduce duplication of work.

  Leverage ASTM International technical working committees and integrate into a whole-of-industry perspective.

  Bring all stakeholders to the table to support objectives.

- **Ensure efforts are industry-led and user-driven:** technology must work for the end user even if they don't understand the technology. It will be important to understand what the technology is enabling, rather than just what it is.
- **Provide thought leadership** to influence global standards through technical committees and broader forums

Q&A

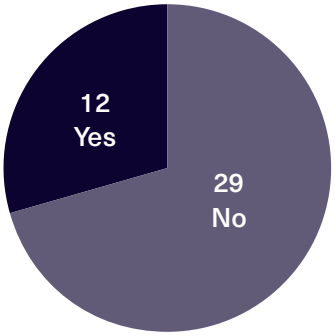
Below is a summary of additional insights provided during the question-and-answer section.

- **Engaging small- and medium-sized enterprises in standardization** can be more effective when timed strategically in the process. Trade associations can serve as a conduit for involving organizations that lack dedicated standards staff. Additionally, targeted outreach helps communicate the value of participation.
- **Balancing technical expertise required with need for increased engagement** should start with identifying the reason for the standards. Focusing a group of diverse experts on an end goal can consolidate a lot of different ideas from varying backgrounds. It is important to get a diverse group in the room so they can challenge each other and learn from each other.

PARTICIPANT POLL: CHALLENGES AND OPPORTUNITIES TO ACCELERATE CET ADVANCEMENTS

Following the industry speakers, participants were asked to share their perspective on challenges and opportunities. A summary of the polling results is provided below.

Are you a small- or medium-sized industry enterprise/manufacturer?



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Workshop Summary Day 1: Speakers and Panelists

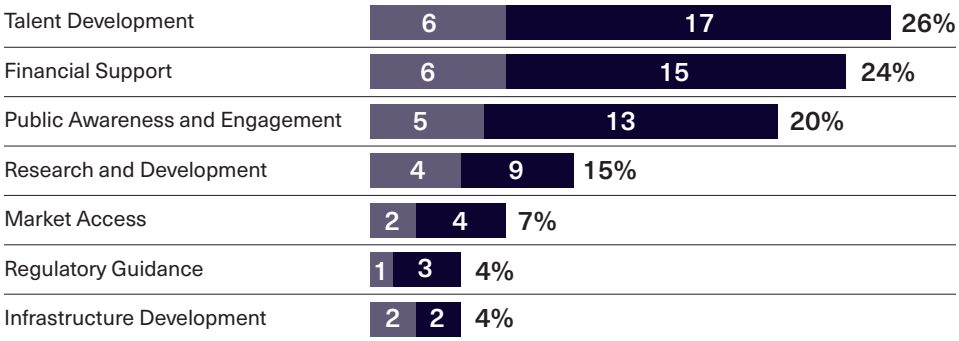
What is the most significant barrier preventing industry from actively participating in standards development efforts?

Key Themes [N=41]	SME Conclusions	Non-SME Conclusions
Funding Constraints and Resource Limitations	– Travel and participation costs, lack of financial support, and membership fees – Limited staff; inability to dedicate personnel to long-term standards engagement	– Difficulty justifying costs or securing travel budgets – Competing priorities – Limited availability of technical staff
Awareness and Access	– Difficulty identifying how to get involved or where to find relevant opportunities	– Gaps in internal awareness; desire for better outreach and engagement strategies
Value Proposition and ROI	– Tangible benefits of participation in standards development are not clear, especially with limited resources	– Challenging to communicate the strategic value of standards participation to those in leadership
Other Barriers	– Challenging to communicate the strategic value of standards participation to those in leadership	– Complexity, bureaucracy, difficulty navigating the standards ecosystem

What are the most promising opportunities to accelerate advancements of CETs? (Select up to 3)

The chart below ranks the most promising opportunities and includes additional breakdown between small and medium sized enterprises/organizations (Yes, SME) and larger organizations (Not SME).

Most promising CET acceleration opportunities [N=31]. ● SME ● Not SME



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Workshop Summary Day 1: Speakers and Panelists

Panel Discussion: Accelerating Standardization Process

A panel of five individuals active in standards processes shared their experience and lessons learned on how to most effectively engage in standards development organizations and implementing partner activities and ideas for accelerating progress.

Muhammad Ali is a Senior Standards Strategy and Policy Leader for HP, Inc. He manages the external standards engagement and leading HP's efforts in U.S.-based standards organizations. Ali is a Certified Standards Professional with over 13 years of leadership in voluntary consensus-based standards development, conformity assessment, and emerging technologies in consumer and electrical industry sectors.

Dr. Marc Horner is a distinguished engineer leading technical initiatives for the healthcare industry at Ansys. Dr. Horner currently holds several industry leadership positions, with a focus on model credibility frameworks, regulatory science, and clinical applications.

Vikas Malhotra is the founder of WOPLLI, a next generation experiences company focused on making our experiences (as we work, play, learn, and live) safe, fair, and trusted. Malhotra is the chair of the IEEE Industry Connections (IC) Program on Cybersecurity for Next Generation Connectivity Systems and contributes to many IEEE standards work groups.

Roberta Nelson Shea is a Global Technical Compliance Manager at Universal Robotics, part of Teradyne Inc. With more than 47 years of experience in automation safety and standardization, she is responsible for global product compliance, risk management, and improving knowledge of robotic safety.

Barnaby Simkin is the Director of Trustworthy AI (Risk Management) at NVIDIA. He leads the development of scalable AI risk management systems spanning multiple business units, ensuring alignment with overarching legal and operational requirements.

DISCUSSION

This section includes a summary of the discussion. It is not a verbatim transcript, and similar ideas are grouped together.

Why should industry engage in the standards process?

- **Standards can help establish compliance:** Standards are necessary to help engineers navigate ambiguous compliance regulations, which are often vague on purpose to be future proof. Demonstrating compliance with an industry standard can help bridge the regulatory gaps between markets.
- **Standards are an integral part of business strategy:** Companies should look at standards as a tool to accomplish business goals and objectives, and an opportunity to provide their perspective in the development process.
- **Standards development processes support professional growth:** Standards processes require collaboration for a common goal. The process is a learning experience and helps develop relationships and broader skills.

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Workshop Summary Day 1: Speakers and Panelists

What are some of the challenges of engaging in the standards development process?

- **Resource requirements to participate** in the standardization process. The process relies on the voluntary contributions of subject matter experts to make standards useful. This requires a relationship of trust and mutual respect, diffusion of responsibilities, and specializations requiring the right people to be in the room. It is expensive and time-consuming to participate in the processes.

  While video calls are more convenient, the move away from in-person meetings has reduced active engagement and robust discussion, making these discussions less effective.

- **Duplication of effort** compounds the cost/resource requirements. Multiple standards organizations are working on similar standards or there are standards developed domestically that are not recognized internationally. Industry is put in the position where they must participate in multiple efforts.

- **Overwhelming number of standards** makes it complicated for companies to navigate. Often individuals who participate in standards activities have other responsibilities and are less familiar with the standards process, terminology, writing approach. This can make it difficult to ensure the right people are engaged and can stay engaged.

  Many individuals involved in the process do not understand how to participate and how to write standards, the requirement for consensus, and the need for validation. Training and resources are needed for individuals participating in the process.

What value do SDOs provide and what can they do to add more value?

- **Foster collaboration with consortia:** Rather than viewing consortia as competition, SDOs should actively collaborate to align efforts and r educe duplication.

- **Provide training and expertise:** SDOs have a responsibility to equip their members with the knowledge, guidance, and tools needed to become experts in standards development.

- **Harmonize terminology across efforts:** Consistent language reduces confusion and improves coordination across different standards initiatives.

  Clarify evolving vocabulary: Misunderstandings often arise from discipline-specific terminology. Broader participation can help address this, but contributors must understand that language evolves and must be clearly defined by end users.

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Workshop Summary Day 1: Speakers and Panelists

What do you hope for or expect to see from the Center of Excellence?

- **Remove administrative burden:** Participation in standards development is costly and time-consuming. The Center should help streamline involvement so engineers can focus on contributing their expertise.
- **Connect related efforts:** The Center should identify and highlight ongoing initiatives in similar topic areas to reduce fragmentation and promote combined efforts.
- **Establish data collection best practices:** Clear, consistent approaches to data collection will support more effective standards development and implementation.
- **Strengthen workforce development:** The Center should prioritize training and education to ensure more people understand how to engage in standards development processes more effectively.

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Workshop Summary Day 2: Priority Standards Activities

This section includes a synthesis of inputs from five breakout groups organized around ASCET's four foundational topic areas: Pre-standardization Engagement, Workforce Capacity Building, Information and Data Sharing, and Collaborative Pilot Programs. Each group addressed the central question: What specific standards activities are essential to accelerate progress and establish U.S. leadership in CETs? The sessions were designed to encourage brainstorming, prioritization, and cross-sector collaboration.

Each topic area includes two complementary elements: a **set of synthesized themes** developed post-workshop to interpret and organize the discussions, and a **cross-summary of specific activities captured in real time during the five breakout sessions**. Together, these perspectives provide both a high-level synthesis and a detailed account of participant input. While most ideas fall within ASCET's scope, some—such as advocating for direct funding mechanisms or proposing changes to regulatory agency functions—are outside the permissible activities of a NIST-funded center but are included here to reflect the full range of stakeholder contributions. More detailed information from the breakout groups can also be found in Appendix B.

Pre-standardization Engagement

This section outlines strategies to engage stakeholders early, identify standards gaps, and build momentum for CET standardization through inclusive and collaborative approaches.

THEMES OF SCOE TOPIC AREA STANDARDS ACTIVITIES

Mapping the Stakeholder Landscape
Explores approaches for identifying and engaging diverse CET stakeholders across sectors to ensure inclusive and informed standards development

Assessing Needs and Standards Gaps
Highlights methods for conducting gap analyses and developing CET-specific roadmaps to prioritize standards activities based on commercialization and risk

Educating and Informing Stakeholders
Covers outreach strategies aimed at increasing awareness of the standards process among C-suite leaders and non-traditional participants

Convening Forums for Standards Advancement
Describes efforts to establish targeted public-private forums that establish annual priorities, promote seed documents, and align business incentives

Supporting and Sustaining Participation
Focuses on mechanisms such as financial incentives and institutional support to lower participation barriers in standards development

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Workshop Summary Day 2: Priority Standards Activities

PRIORITY STANDARDS ACTIVITIES

- **Identify and engage all relevant stakeholders** across the CET ecosystem
- **Conduct gap analysis** and landscape assessments to guide ASCET's focus
- **Adopt roadmap approaches for each CET** to identify specific gaps, prioritize actions, and convene inclusive stakeholder groups
- **Educate key stakeholder groups**—including C-suite leaders and non-traditional participants—on the standards process, how to engage, and the benefits and business rationale of engagement
- **Facilitate the use of seed documents** from smaller organizations to initiate formal standards development
- **Convene public-private forums** to identify annual priorities and foster collaboration across stakeholder groups
- **Advocate for financial incentives and support mechanisms** to reduce participation barriers in standards development

Workforce Capacity Building

This section highlights initiatives to strengthen the CET standards workforce through education, training, mentorship, and inclusive participation models.

THEMES OF SCOE TOPIC AREA STANDARDS ACTIVITIES

Preparing Organizations for Standards Participation
Addresses the creation of training programs and resources to help SMEs and professionals navigate global standards systems and compliance

Fostering Leadership and Long-Term Engagement
Emphasizes the development of mentorship models, succession planning tools, and leadership pipelines to sustain long-term engagement in standards

Integrating Standards into Education and Early Careers
Highlights initiatives to embed standardization education into undergraduate and graduate curricula, internships, and credentialing pathways for early-career professionals

Enabling Inclusive and Agile Participation
Explores inclusive and flexible participation models that reduce barriers for underrepresented groups and recognize non-traditional contributions

PRIORITY STANDARDS ACTIVITIES

- **Educate SMEs and emerging professionals on global standards initiatives and CETs** through targeted training, including internships, apprenticeships, accreditation programs such as ABET, and integration into undergraduate and graduate curricula

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Workshop Summary Day 2: Priority Standards Activities

- **Create and implement training programs and resources** that cover compliance, standards development processes, and workforce readiness, and embed them into onboarding and professional development
- **Develop toolkits and training to help C-suite leaders** champion standards engagement and support employee participation
- **Promote non-traditional, flexible, and agile approaches** to standards development that support innovation and adaptability and offering training to inform and encourage industry to participate
- **Launch multi-directional mentorship, shadowing, and success planning programs** to strengthen leadership pipelines and support early-career professionals

Information and Data Sharing

This section focuses on improving access to standards-related information, raising awareness, and building infrastructure to support knowledge exchange across the CET ecosystem.

THEMES OF SCOE TOPIC AREA STANDARDS ACTIVITIES

Raising Standards Awareness and Communicating Value
Focuses on strategies to educate external stakeholders on CETs and the benefits of standards using accessible, non-technical language

Improving Access to Standards Resources
Describes efforts to centralize access to global standards materials, terminology, and best practices through searchable repositories and toolkits

Building Knowledge Infrastructure
Covers the development of CET-specific information hubs and databases that consolidate standards activities, terminology, and lessons learned

PRIORITY STANDARDS ACTIVITIES

- **Educate new and non-traditional stakeholders on CETs** and the role of standardization in advancing U.S. interests
- **Communicate the value of standards participation**—especially for small and emerging companies—by highlighting incentives, use cases, and real-world impacts of using standards
- **Provide access to global standards resources** including policies, best practices, and CET terminology repositories
- **Build and maintain a searchable, open-access standards library** and ecosystem database with metadata tagging, contributor records, and feedback mechanisms

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Workshop Summary Day 2: Priority Standards Activities

- **Establish and pilot CET-specific information hubs** that consolidate standards activities, terminology, and best practices
- **Share lessons learned and best practices from standards development** to guide new contributors and improve quality

Collaborative Pilot Programs

This section presents ideas for piloting CET standards in real-world environments to validate approaches, align stakeholders, and accelerate adoption.

THEMES OF SCOE TOPIC AREA STANDARDS ACTIVITIES

Testing and Demonstrating CET Standards
Highlights pilot initiatives that test CET standards, metrology, and market readiness in collaborative, secure environments

Driving Stakeholder Alignment and Execution
Focuses on deploying CET-specific facilitators and cross-sector teams to implement roadmap priorities and ensure broad stakeholder engagement

Designing Adaptive Frameworks for Evolving CET Standards
Describes the creation of flexible, future-proof standards frameworks that accommodate CET evolution and interoperability

Streamlining Government Adoption of CET Standards
Explores pilot pathways for faster, more flexible government adoption of CET standards, with support from agencies like NIST

PRIORITY STANDARDS ACTIVITIES

- **Pilot parallel processes for standards development,** metrology, conformity assessment, and market readiness
- **Establish environments for safe, collaborative testing and piloting** of CETs among public and private sectors
- **Assign CET-specific facilitators** to lead coordination and stakeholder engagement, and **deploy cross-sector teams to implement roadmap priorities**
- **Create a future-proof, flexible standards development framework** that supports CET evolution and interoperability
- **Streamline government adoptions of CET standards**—especially in regulated sectors—by enabling faster integration and leveraging agencies like NIST

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Appendix A: Day 1 Mentimeter Polling Results

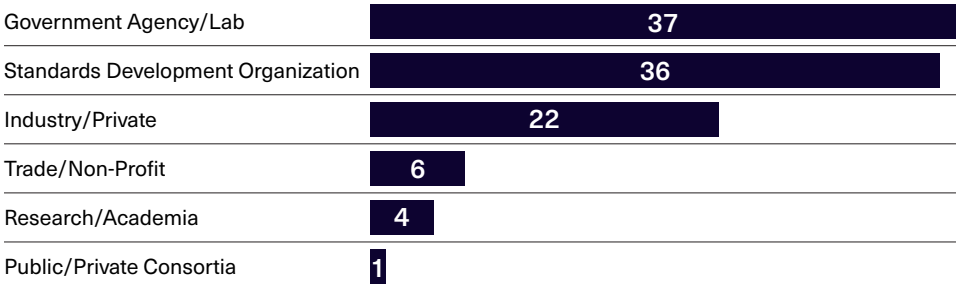
Throughout Day 1 of the first ASCET Center of Excellence Standardization Workshop, attendees participated in four separate polls conducted through the Mentimeter platform. This appendix captures all of the results in one location.

POLL NAME	
Poll #1: Stakeholders and CETs of Interest	1. Which stakeholder type do you represent? 2. Which state did you travel from? 3. Which CETs are you interested in?
Poll #2: Role of Government in CET Advancement	1. In what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Poll #3: Takeaways from Government Speakers	1. What is your biggest takeaway from the panel on government perspectives?
Poll #4: Challenges and Opportunities to Accelerate CET Advancement	1. Are you a small- or medium-sized industry enterprise? 2. What is most significant barrier preventing industry from actively participating in standards development efforts? 3. What are the most promising opportunities to accelerate advancements of CETs?

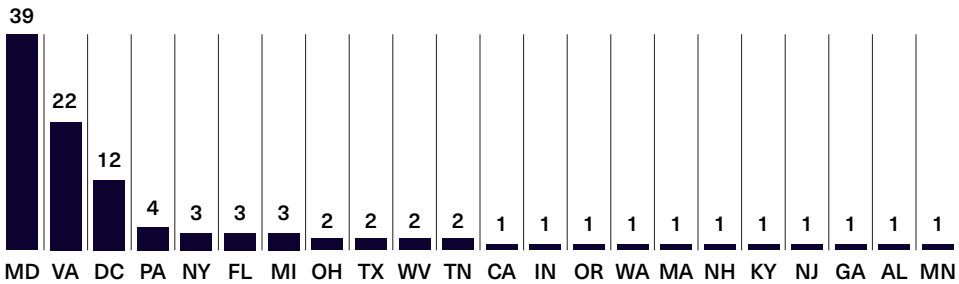
The following section presents a summary of the Mentimeter polling results.

MENTIMETER #1: STAKEHOLDERS AND CETS OF INTEREST

Stakeholder Types [N=106]



Stakeholders by State [N=105]



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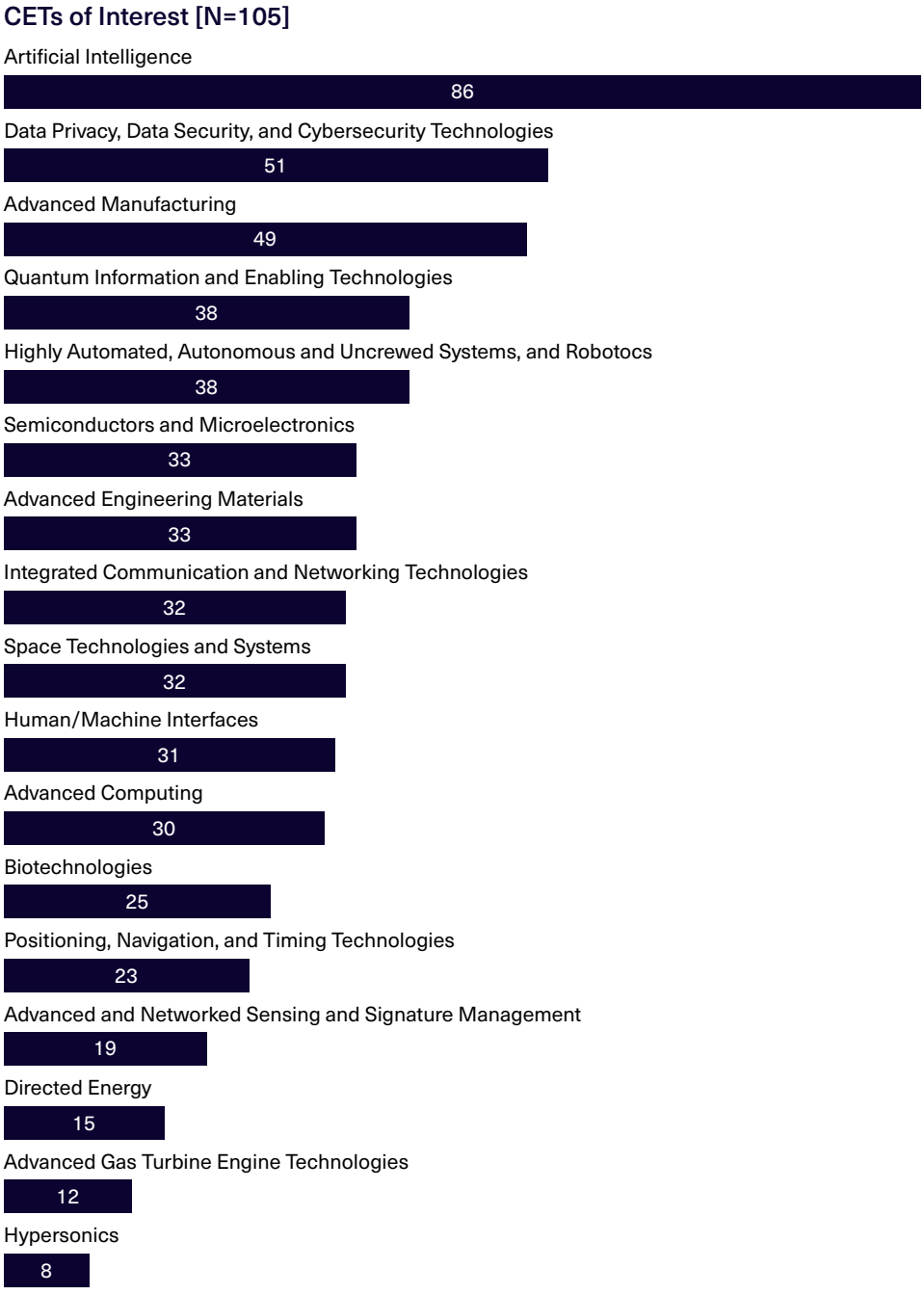
Appendix A: Day 1 Mentimeter Polling Results



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Appendix A: Day 1 Mentimeter Polling Results

MENTIMETER #2: ROLE OF GOVERNMENT IN CET ADVANCEMENT

Themes, Percent of Respondents	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Stakeholder Convening & Engagement 56%	– **Enable cross-sector collaboration** including consensus-building, balanced participation, and international coordination – **Enable participation of SMEs** by funding and supporting their involvement in standards activities – **Participate in standards committees** through drafting/ideating and in leadership roles – **Build public-private partnerships** to foster cooperation and shared responsibility in standards development
Funding Support 46%	– **Increase and sustain funding** for R&D and early-stage pre-standardization – **Provide financial incentives** for organizations and industries to engage in and support standardization activities – **Provide long-term, strategic funding** to build economies of scale and foster market creation
Strategy & Regulatory Policy 29%	– **Set clear priorities and identify needs early,** developing national roadmaps to guide standards development – **Streamline and align regulations to support innovation** including minimizing interferences, cutting red tape, and coordinating across agencies
Other Responses –	– **Develop the human capital** needed for standards development through education and training programs – **Provide shared resources and technical expertise** including infrastructure – **Promote awareness and participation** in standards through outreach, communication, and advocacy

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Appendix A: Day 1 Mentimeter Polling Results

MENTIMETER #3: TAKEAWAYS FROM GOVERNMENT SPEAKERS

Themes	Specific Responses [N=80]: in what ways can the government most effectively accelerate the advancement of critical and emerging technologies?
Cross-Sector Collab. and Coordination	– **Emphasis on need for stronger cross-sector and cross-agency collab.** to address shared challenges and avoid duplication of efforts – **Public-private partnerships essential** for aligning missions, sharing resources, and speeding up joint efforts – **Communication gaps and siloed operations** remain significant barriers to collaborating on standards – **Transparent data** sharing is key for building stakeholder trust
Complexities in Standardization and Interface Management	– **Fragmented, inconsistent, and overlapping standards** are major sources of confusion, inefficiency – **Interface management is a recurring challenge** (i.e., ensuring different standards and systems can work together) – **Integrated, cross-cutting standards must adapt to evolving use cases** to enable the convergence of CETs (e.g., AI, IoT, cybersecurity) – **Need for "fit for purpose" standards** aligned with different technology readiness levels (TRLs) – **Consensus-driven standards development,** while valuable, has not kept pace with CET innovation – **Desire to reference existing standards**—not create new regulations—to streamline CET adoption and provide the tools needed by SDOs and industry – **Need for new, agile approaches to standards development** that maintain quality without sacrificing speed
Accelerated Technology Experimentation and Deployment	– **Accelerating AI technology development** could help all other CET advancement move faster – **U.S. is lagging China in rapid experimentation;** more test beds and pilot programs are needed to validation CETs in real-world environments
Workforce Capacity Building	– **Workforce shortages in CETs** are major concern; this should be a strategic priority for national competitiveness and U.S. leadership – **Universities could create/offer courses/degrees in "standards training"** to support SMEs, ensuring a pipeline of skilled professionals – **Academic engagement and public awareness must enable earlier exposure to standards-related education** to build long-term workforce capacity

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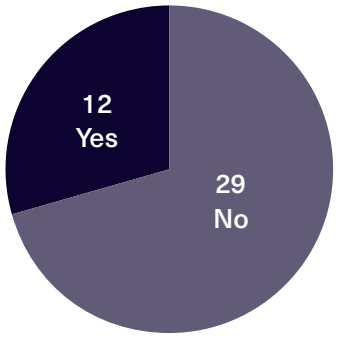
Appendix A: Day 1 Mentimeter Polling Results

MENTIMETER #4: CHALLENGES AND OPPORTUNITIES TO ACCELERATE CET ADVANCEMENTS

Are you a small- or medium-sized industry enterprise/manufacturer?



What is the most significant barrier preventing industry from actively participating in standards development efforts?

Key Themes [N=41]	SME Conclusions	Non-SME Conclusions
Funding Constraints and Resource Limitations	– Travel and participation costs, lack of financial support, and membership fees – Limited staff; inability to dedicate personnel to long-term standards engagement	– Difficulty justifying costs or securing travel budgets – Competing priorities – Limited availability of technical staff
Awareness and Access	– Difficulty identifying how to get involved or where to find relevant opportunities	– Gaps in internal awareness; desire for better outreach and engagement strategies
Value Proposition and ROI	– Tangible benefits of participation in standards development are not clear, especially with limited resources	– Challenging to communicate the strategic value of standards participation to those in leadership
Other Barriers	– Challenging to communicate the strategic value of standards participation to those in leadership	– Complexity, bureaucracy, difficulty navigating the standards ecosystem

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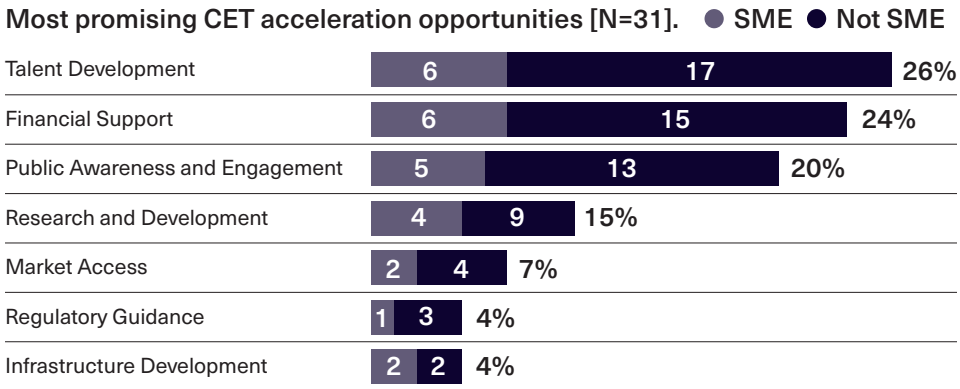
Appendix A: Day 1 Mentimeter Polling Results

What are the most promising opportunities to accelerate advancements of CETs? (Select up to 3.)



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Appendix B: Specific Standards Activities from Day 2

This appendix includes more detailed information from the five parallel breakout groups.

Facilitators posed the following focus question across 5 breakout groups:

? **What specific standards activities are essential to accelerate progress and establish U.S. leadership in CETs?**

The following tables summarize the specific standards activities identified by participants, representing an aggregation of inputs collected across all five breakout groups and organized by the four Center of Excellence topic areas.

PRE-STANDARDIZATION ENGAGEMENT

Themes	Priority Standards Activities
Mapping the Stakeholder Landscape	– Map the CET ecosystem by identifying key stakeholders, supply chain actors, and critical needs across the value chain – Engage a broad spectrum of stakeholders across industry, academia, and government to ensure inclusive participation in standards development
Assessing Needs and Standards Gaps	– Conduct gap analysis on CET standards landscapes (measurement, validation, etc.) to understand where ASCET should focus its efforts – Adopt a roadmap-type approach for each key CET to identify specific standards gaps, convene inclusive stakeholder groups, and prioritize actions needed for scale-up and commercialization[5] – Crowdsource input on technology landscape gaps and priority areas for standards development
Educating and Informing Stakeholders	– Educate "C-suite" professionals on standards and connect standards to business rationalization (costs, profits, etc.) – Make standards attractive to experts without standards experience and conduct outreach – Educate stakeholders on the role of standards to support advocacy in a highly political technological environment

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Appendix B: Specific Standards Activities from Day 2

PRE-STANDARDIZATION ENGAGEMENT

Themes	Priority Standards Activities
Convening Forums for Standards Advancement[6]	– Create industry connection/private-public forums with specific goals to share information and identify 5-10 top priorities per year and form forums for those areas – Identify and promote seed documents—such as guidance materials or documented gaps—developed by smaller organizations that can serve as starting points for formal standards development by larger SDOs – Establish targeted forums to explore business case alignment in CET standards development, focusing on commercial success, profitability, and market value to attract diverse stakeholders—especially small businesses[7]
Supporting and Sustaining Participation	– Advocate for financial incentives (e.g., tax credits, funding) for CET-related R&D and establish a government affairs group – Develop financial support mechanisms—such as grants, tax incentives, and government sponsorships—to reduce the cost burden on companies participating in standards development, and provide accessible facilities for hosting meetings

WORKFORCE CAPACITY BUILDING

Themes	Priority Standards Activities
Preparing Organizations for Standards Participation	– Educate the U.S. SMEs in global standards initiatives and protocols to effectively operate in those systems – Develop training on standards processes and compliance for strategic CET areas[8] – Identify and evaluate existing training, education, and grant opportunities to improve awareness and highlight best practices – Develop a toolkit to help C-suite leaders communicate the value of early and sustained standards engagement across their organizations
Fostering Leadership and Long-Term Engagement	– Develop tools and resources including guidance and best practices for multi-directional mentorship and succession planning – Develop a "Standards Education Roadmap," intended for all education levels, in collaboration with SCoE stakeholders[9]

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Appendix B: Specific Standards Activities from Day 2

WORKFORCE CAPACITY BUILDING

Themes	Priority Standards Activities
Integrating Standards into Education and Early Careers[10]	– Prepare the next generation of engineers by integrating standards education into undergraduate programs, offering internships and apprenticeships, and aligning new credentials with accreditation bodies[11] – Equip early-career professionals with training, mentorship, and accessible content to support active participation in standards development[12]
Enabling Inclusive and Agile Participation	– Promote inclusive, flexible standards development by reducing workforce participation barriers—especially for underrepresented groups and small businesses—and recognizing non-traditional contributions[13]
Raising Standards Awareness and Communicating Value[14]	– Educate external stakeholders[15] —using accessible and non-technical language—on CETs and the benefits of setting standards to achieve U.S. interests – Communicate clear value of participating in the standards process particularly for small, medium, and newer companies including articulating incentives, use cases, and real-world impacts of standards
Improving Access to Standards Resources	– Gather information and provide access to policy and procedures, best practices, and core competencies including a resource for identifying global standards[16] – Host repositories of CET terminology, taxonomy, and ontology – Prepare a list of published standards, by CET, with a feedback mechanism and template
Building Knowledge Infrastructure	– Establish and regularly update a CET-specific information hub that includes relevant SDOs, terminology, current activities, and best practices, starting with a pilot – Build a searchable online database of the CET standards ecosystem, including abstracts, terminology (with metadata), contributors, and full development histories[17] – Establish a complete standards library relative to industry-specific topics that is accessible for free by U.S. organizations (i.e., for the purposes of informing standards development) – Share best practices and lessons learned from standards development activities to improve quality and guide new contributors

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Appendix B: Specific Standards Activities from Day 2

COLLABORATIVE PILOT PROGRAMS

Themes	Priority Standards Activities
Testing and Demonstrating CET Standards	– Pilot programs to test parallel processes (metrology, standards development, conformity, market, etc.) for CETs – Create environments for safe and secure testing and piloting CET development in collaboration between the public and private sectors[18]
Driving Stakeholder Alignment and Execution	– Establish dedicated facilitators for each CET to lead stakeholder engagement, validate standardization landscapes, identify pre-standardization priorities, and ensure inclusive participation (especially from small and medium-sized enterprises) – Deploy cross-sector technology teams—including government, industry, students, and academia—to implement roadmap objectives and drive CET standards priorities[19]
Designing Adaptive Frameworks for Evolving CET Standards	– Create a future-proof standards development framework (including language, taxonomy) with the flexibility to allow CET standards to evolve (e.g., "backwards-compatible" standards)[20]
Streamlining Government Adoption of CET Standards	– Pilot faster, more flexible pathways for government adoption of CET standards, focusing on de-risking and leveraging agencies like NIST for streamlined implementation[21]

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Appendix C: Workshop Agenda

DAY 1 – WEDNESDAY, MAY 14, 2025

9 a.m.	**Introduction to the SCoE** Joint presentation by National Institute of Standards and Technology (NIST) and ASTM introducing participants to the SCoE and reviewing workshop objectives and expected outcomes – **Shyam Sunder,** NIST – **Andy Kireta,** ASTM International **Vision to Action: Launching the U.S. Center of Excellence for CET Standardization** – **Mohsen Seifi,** ASTM International
10:15 a.m.	**Government Perspectives on CETs and Needed Standards** Brief presentations from government agencies focused on the development and use of standards for CETs, challenges they are facing, and opportunities for acceleration. Followed by Q&A. – **Tim Klein,** U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology – **Huijuan Dai,** U.S. Department of Energy – **Sheng Lin-Gibson,** NIST – **Paul Gill,** National Aeronautics and Space Administration (retired) – **Cindy Waters,** Naval Surface Warfare Center
3:15 p.m.	**Panel Discussion: Accelerating Standardization Processes** A panel of participants active in standards processes will share their experience and lessons learned on how to most effectively engage in standards development organizations and implementing partner activities and ideas for accelerating progress. – **Roberta Nelson Shea,** Universal Robotics – **Muhammad Ali,** HP – **Marc Horner,** Ansys – **Vikas Malhotra,** WOPLLI – **Barnaby Simkin,** NVIDIA

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Appendix C: Workshop Agenda

DAY 1 – WEDNESDAY, MAY 14, 2025

4:30 p.m.	**Recap and Next Steps**
5 p.m.	**Networking Reception**

DAY 2 – THURSDAY, MAY 15, 2025

9 a.m.	**Welcome, Recap of Day 1, Instructions for Day 2** ASTM and Nexight Group
9:30 a.m.	**Breakout Groups: Identifying Needed Standards Activities** Participants will join one of 5 breakout parallel breakout sessions. Each breakout session will discuss the following question: *What specific standards activities are essential to accelerate progress and establish U.S. leadership in CETs?*
11 a.m.	**Breakout Groups: Identifying Needed Standards Activities (continued)** Participants will continue in their breakout sessions and prepare Breakout Session Report-Outs.
1 p.m.	**Breakout Groups: Report-Outs** Each Breakout Group will share the results of their discussions with the broader group, looking for common themes, areas of divergence, and opportunities for cross-CET collaboration for improved speed and efficiency.
2:45 p.m.	**Operationalizing the SCoE** Presentation and group discussion of how participants can continue to be involved in the SCoE's activities.
4 p.m.	**Next Steps and Closing Remarks**
4:30 p.m.	**Adjourn**

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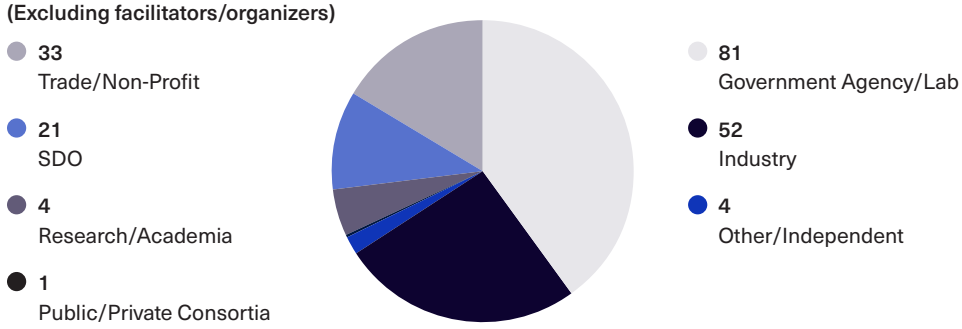
Appendix D: Stakeholder Types and Attendee List

This appendix provides a summary of the stakeholder types across both workshop days (excluding facilitators and organizers) and a complete list of workshop attendees.

Workshop Attendees by Stakeholder Type
(Excluding facilitators/organizers)



Daniel Abbate	National Electrical Manufacturers Association (NEMA)
David Alexander	SAE International
Muhammad Ali	HP
Clare Allocca	National Institute of Standards and Technology (NIST)
Jonathan Archer	SAE International
Shelly Bagchi	National Institute of Standards and Technology (NIST), CHIPS R&D Office
Simon Baidoo	U.S. Department of Homeland Security, Science and Technology Directorate's (S&T) Systems Engineering and Standards
Megan Barnhart	U.S. Department of Energy
Patrick Barry	Mobile Industrial Robots (MiR)
Clare Beahn	U.S. Department of Homeland Security
Mary Bedner	National Institute of Standards and Technology (NIST), CHIPS R&D Office
Aaron Benlolo	Independent/Private Sector
Christine Bernat	American National Standards Institute (ANSI)
Joshua Bienfang	National Institute of Standards and Technology (NIST)
George Borlase	UL Standards & Engagement (ULSE)
Glenn Bosmans	Independent/Private Sector
Kenneth Boyce	UL Solutions

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Everett Bradshaw	Association of Materials Protection and Performance (AMPP)
Ross Brindle	Nexight Group
Kim Brown	ASTM International
Sabine Brueske	Nexight Group
Sonia Buckley	National Institute of Standards and Technology (NIST)
Mayeline Burdie	U.S. Environmental Protection Agency
Lisa Carnahan	National Institute of Standards and Technology (NIST)
Justin Cassamassino	ASME
Jennifer Caswell	U.S. Department of the Treasury, Office of Financial Research
Daniel Chidgey	Accuris
Joannie Chin	National Institute of Standards and Technology (NIST)
Hae Choe	National Electrical Manufacturers Association (NEMA)
Kai-Dee Chu	U.S. Department of Homeland Security
Jacob Collard	National Institute of Standards and Technology (NIST)
Andrew Conn	National Institute of Standards and Technology (NIST)
Fredric Constantino	ASME
Addie Cooke	Google
Jill Crisman	UL Research Institutes
Joel Curneal	JOCUSolutions LLC
Huijuan Dai	U.S. Department of Energy
Paul D'Amico	U.S. Department of the Treasury, Office of Financial Research
Karsten Daponte	Nexight Group
Amber Day	American Type Culture Collection (ATCC)
Frederic De Vaulx	Prometheus Computing LLC
Katya Delak	National Institute of Standards and Technology (NIST)
Mary Jo DiBernardo	National Institute of Standards and Technology (NIST)
Dennis Duncan	Nokia Bell Labs
Frank Ehrenfeld	Eurofins Built Environmental Testing

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Rehan Ehsan	Samsung Electronics America
Mohammad Farahi	ASTM International
Charlotte Farmer	UL Research Institutes
Dan Feighery	Action Engineering
Jessica Fitzgerald-McKay	National Security Agency's (NSA) Center for Cybersecurity Standards (CCSS)
Magdalene Fogarasi	Nexight Group
Carole Franklin	A3
Dennis Fritz	Fritz Consulting
Kerri Fulton	GS1 US
Anders Garlid	UCLA Medical & Imaging Informatics (UCLA MII)
Sadanand Gite	Abbott
Barbara Goldstein	National Institute of Standards and Technology (NIST)
S. William Gouse	SAE International
Jaydee Griffith	Alliance for Telecommunications Industry Solutions (ATIS)
Edward Griffor	National Institute of Standards and Technology (NIST)
Charlie Grove	ASTM International
Jeff Grove	ASTM International
Varadraj Gurupur	University of Central Florida
Davis Hackenberg	Reliable Robotics
Craig Hamill	UL Research Institutes
Stephanie Hampton	Concrete Compass
Evan Handler	Naval Surface Warfare Center, Carderock Division (NSWC Carderock)
Kerri Haresign	Consumer Technology Association
Ainsley Hargest	Federal Reserve Financial Services
Tyler Harris	Packaging Technologies & Inspection (PTI)
Craig Hart	U.S. Department of Commerce
Brent Hartman	CSA Group
Ashley Hartwell	National Institute of Standards and Technology (NIST)

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Appendix D: Stakeholder Types and Attendee List

Megan Hayes	National Electrical Manufacturers Association (NEMA)
Michael Heaphy	U.S. Department of Defense (DoD)
Michele Romeyn Hill	Independent/Private Sector
MaryAnn Hogan	National Institute of Standards and Technology (NIST)
JoVaun Holmes	U.S. Department of Homeland Security
Ashley Hopko	Nexight Group
Jeffrey Horlick	National Institute of Standards and Technology (NIST)
Marc Horner	Ansys
Meghan Housewright	UL Solutions
Ahing Huang	ASTM International
Ashley Huderson	ASME
Eric Hudson	ASTM International
Rick Huff	ASTM International
Kate Hyam	ASME
Raj Iyengar	U.S. Nuclear Regulatory Commission
Sierra Jackson	National Academies of Sciences, Engineering, and Medicine's Government-University-Industry-Philanthropy Research Roundtable (NASEM-GUIPRR)
Nazish Jeffery	Federation of American Scientists
Timothy Jeffries	Futurewei Technologies, Inc.
J. Jegan	Flex Ltd.
Ajit Jillavenkatesa	Apple
John Paul Jones	National Institute of Standards and Technology (NIST)
Franck Journoud	National Association of Manufacturers (NAM)
Inhye Kang	Association of Home Appliance Manufacturers (AHAM)
Ben Kassel	University of Maryland's Applied Research Laboratory for Intelligence and Security (ARLIS)
Kevin Kelly	ASTM International
Walid Keyrouz	National Institute of Standards and Technology (NIST)
Richard King	SAE International

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Bethany King Wilkes	UL Research Institutes
Kayla Kingseed	Nexight Group
Timothy Klein	U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology
Denis Kluba	Rosewood Manor, Inc.
Maria Knake	National Institute of Standards and Technology (NIST)
Jared Kosters	Nexight Group
Kishore Kotha	ECS Limited
Kristen Kulinowski	Science and Technology Policy Institute
Paulina Kuo	National Institute of Standards and Technology (NIST)
Bryan Laskin	National Academies of Sciences, Engineering, and Medicine's Government-University-Industry-Philanthropy Research Roundtable (NASEM-GUIPRR)
Dana Leaman	National Institute of Standards and Technology (NIST)
Stephen Leinweber	ASTM International
Ya-Shian Li-Baboud	National Institute of Standards and Technology (NIST)
Garra Liming	American Society for Nondestructive Testing (ASNT)
Austin S. Lin	Quantum Economic Development Consortium (QED-C)
Sheng Lin-Gibson	National Institute of Standards and Technology (NIST)
Katrice Lippa	National Institute of Standards and Technology (NIST)
Caroline Lord	Nexight Group
Sherry Loughrey	U.S. Department of Defense (DoD)
Patrick Lozada	Telecommunications Industry Association
William Lyons	Boeing
Raj Madhavan	National Institute of Standards and Technology (NIST)
Nicholas Malatesta	Office of U.S. Senator Mark Warner
Vikas Malhotra	WOPLLI
Alan Manche	Schneider Electric
Brian Marchionini	National Electrical Manufacturers Association (NEMA)
Steve Margis	UL Solutions

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Oliver Martinez	ASME
Jeremy Marvel	National Institute of Standards and Technology (NIST)
Khaled Masri	National Electrical Manufacturers Association (NEMA)
Kristy Mastromichalis	Compressed Gas Association, Inc.
Karen McCabe	IEEE
Tom McGarry	Telecommunications Industry Association
Drake McGregor	Aerospace Industries Association
Megan McMillan	U.S. Department of Commerce
Brian Meincke	ASTM International
Dimitrios Meritis	U.S. Department of State, Bureau of Cyberspace & Digital Policy
Teresa Metcalfe	American Society of Civil Engineers (ASCE)
Jeffrey Metzger	InterDigital
Charudatta Mhasde	New York University
Alan Migdall	National Institute of Standards and Technology (NIST)
Ean Mikale	Infinite 8 Institute
Jenaye Minter	National Security Agency's (NSA) Center for Cybersecurity Standards (CCSS)
KC Morris	National Institute of Standards and Technology (NIST)
Len Morrissey	ASTM International
Shawn Moylan	National Institute of Standards and Technology (NIST)
Ethan Myers	ASTM International
Nikolaos Myriounis	Defense Standardization Advice (DEFSTAND PC)
Bryant Nelson	National Institute of Standards and Technology (NIST)
Roberta Nelson Shea	Universal Robots
Aron Newman	National Institute of Standards and Technology (NIST)
Elaine Newton	Amazon
Nathalie Noah	Noah's Consulting
Adam Norton	University of Massachusetts Lowell
David Nufrio	U.S. Department of Commerce
Yaw Obeng	National Institute of Standards and Technology (NIST)

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Appendix D: Stakeholder Types and Attendee List

Edwin Ortiz Quiles	U.S. Department of Homeland Security, Science and Technology Directorate's (S&T) Systems Engineering and Standards
Greg Ott	U.S. Department of Defense (DoD)
Servio Palacios	Independent/Private Sector
Yash Parikh	EOS North America
Darrell Pennington	Air Line Pilots Association (ALPA)
Catherine Perretti	U.S. Department of Homeland Security
Rali Petrova	American Society for Nondestructive Testing (ASNT)
Brandyi Phillips	National Institute of Standards and Technology (NIST)
Dan Pomeroy	U.S. General Services Administration
Adam Porroni	Valerity
Aaron Prather	ASTM International
Gloria Pumpuni-Lenss	UL Research Institutes
Erik Puskar	National Institute of Standards and Technology (NIST)
Prem Rachakonda	National Institute of Standards and Technology (NIST)
Purva Rajkotia	IEEE
Karen Reczek	National Institute of Standards and Technology (NIST)
Kevin Reese	Agility Robotics
John Repp	Elzly Technology Corporation
Nathalie Rioux	National Institute of Standards and Technology (NIST)
Bill Rivers	WP Rivers & Associates
Christine Roberts	Parenteral Drug Association
Rick Roberts	Amazon Robotics
Dario Rodrigues	University of Maryland School of Medicine
Michael Rosa	National Security Agency's (NSA) Center for Cybersecurity Standards (CCSS)
Kris Rush	Carnegie Mellon University's Software Engineering Institute
Kamel Saidi	National Institute of Standards and Technology (NIST)
Andrew Saku	Nexight Group
Christian Sanna	ASME

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Appendix D: Stakeholder Types and Attendee List

Subrata Sanyal	Naval Surface Warfare Center, Corona Division (NSWC Corona)
Mary Saunders	American National Standards Institute (ANSI)
Brian Scarpelli	The App Association
Michael Scovetta	Microsoft
Mohsen Seifi	ASTM International
Michelle Seitz	National Institute of Standards and Technology (NIST)
Titi Shodiya	Infoblox, Inc.
Justin Sikorski	SAE International
Barnaby Simkin	NVIDIA
Eric Simmon	National Institute of Standards and Technology (NIST)
Beth Slaninka	Nexight Group
Dan Smith	ASTM International
Chris Soranno	SICK Product & Competence Center Americas, LLC
Cindy Squires	American Composites Manufacturers Association
Aleksandr Stefaniak	National Institute for Occupational Safety and Health (NIOSH)
Renee Stevens	U.S. Department of Homeland Security, Science and Technology Directorate's (S&T) Systems Engineering and Standards
Bryan Steverson	U.S. General Services Administration
Jennifer Stradtman	Office of the United States Trade Representative
Edward Straub	National Highway Traffic Safety Administration (NHTSA)
Eswaran Subrahmanian	National Institute of Standards and Technology (NIST)
Laura Szakmary	U.S. General Services Administration
Michael Tarlov	National Institute of Standards and Technology (NIST)
Madyson Taylor	Independent/Private Sector
Michael Taylor	National Institute of Standards and Technology (NIST)
Camnga Thach	City of Sunnyvale, California
Christian Thiele	SAE International
Rita Torkzadeh	Kaiser Permanente
David Vaillencourt	The GMP Collective

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Priam Varin	Prometheus Computing LLC
Daniel Vazquez	U.S. Agency for International Development (USAID)
Stephen Walls	Boeing
Cindy Waters	Naval Surface Warfare Center, Carderock Division (NSWC Carderock)
Jamie Weaver	National Institute of Standards and Technology (NIST)
Jeffrey Wheeler	Georgetown University
Matt Williams	Association for the Advancement of Medical Instrumentation (AAMI)
Christa Wright	UL Research Institutes
Diya Wynn	Amazon
Linda Yarlott	University of Maryland, Baltimore County (UMBC)
Dave Yashar	National Institute of Standards and Technology (NIST)
David Young	Alliance for Telecommunications Industry Solutions (ATIS)
Drew Zabrocki	Totem Ltd.
Lenora Zimmerman	Google

A3
Abbott
Accuris
Action Engineering
Aerospace Industries Association
Agility Robotics
Air Line Pilots Association (ALPA)
Alliance for Telecommunications Industry Solutions (ATIS)
Amazon
Amazon Robotics
American Composites Manufacturers Association
American National Standards Institute (ANSI)
American Society for Nondestructive Testing (ASNT)
American Society of Civil Engineers (ASCE)
American Type Culture Collection (ATCC)
Ansys

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Apple
ASME
Association for the Advancement of Medical Instrumentation (AAMI)
Association of Home Appliance Manufacturers (AHAM)
Association of Materials Protection and Performance (AMPP)
ASTM International
Boeing
Carnegie Mellon University's Software Engineering Institute
City of Sunnyvale, California
Compressed Gas Association, Inc.
Concrete Compass
Consumer Technology Association
CSA Group
Defense Standardization Advice (DEFSTAND PC)
ECS Limited
Elzly Technology Corporation
EOS North America
Eurofins Built Environmental Testing
Federal Reserve Financial Services
Federation of American Scientists
Flex Ltd.
Fritz Consulting
Futurewei Technologies, Inc.
Georgetown University
Google
GS1 US
HP
IEEE
Independent/Private Sector
Infinite 8 Institute
Infoblox, Inc.
InterDigital
JOCUSolutions LLC
Kaiser Permanente

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Microsoft
Mobile Industrial Robots (MiR)
National Academies of Sciences, Engineering, and Medicine's Government University-Industry-Philanthropy Research Roundtable (NASEM-GUIPRR)
National Association of Manufacturers (NAM)
National Electrical Manufacturers Association (NEMA)
National Highway Traffic Safety Administration (NHTSA)
National Institute for Occupational Safety and Health (NIOSH)
National Institute of Standards and Technology (NIST)
National Institute of Standards and Technology (NIST), CHIPS R&D Office
National Security Agency's (NSA) Center for Cybersecurity Standards (CCSS)
Naval Surface Warfare Center, Carderock Division (NSWC Carderock)
Naval Surface Warfare Center, Corona Division (NSWC Corona)
New York University
Nexight Group
Noah's Consulting
Nokia Bell Labs
NVIDIA
Office of the United States Trade Representative
Office of U.S. Senator Mark Warner
Packaging Technologies & Inspection (PTI)
Parenteral Drug Association
Prometheus Computing LLC
Quantum Economic Development Consortium (QED-C)
Reliable Robotics
Rosewood Manor, Inc.
SAE International
Samsung Electronics America
Schneider Electric
Science and Technology Policy Institute
SICK Product & Competence Center Americas, LLC
Telecommunications Industry Association
The App Association
The GMP Collective

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Totem Ltd.
U.S. Agency for International Development (USAID)
U.S. Department of Commerce
U.S. Department of Defense (DoD)
U.S. Department of Energy
U.S. Department of Homeland Security
U.S. Department of Homeland Security, Science and Technology Directorate's (S&T) Systems Engineering and Standards
U.S. Department of State, Bureau of Cyberspace & Digital Policy
U.S. Department of the Treasury, Office of Financial Research
U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology
U.S. Environmental Protection Agency
U.S. General Services Administration
U.S. Nuclear Regulatory Commission
UCLA Medical & Imaging Informatics (UCLA MII)
UL Research Institutes
UL Solutions
UL Standards & Engagement (ULSE)
Universal Robots
University of Central Florida
University of Maryland School of Medicine
University of Maryland, Baltimore County (UMBC)
University of Maryland's Applied Research Laboratory for Intelligence and Security (ARLIS)
University of Massachusetts Lowell
Valerity
WOPLLI
WP Rivers & Associates

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Appendix E: Acronyms and Abbreviations

ABET	Accreditation Board for Engineering and Technology
ADLP	Associate Director of Laboratory Programs
AI	artificial intelligence
AIChE	American Institute of Chemical Engineers
AMMTO	Advanced Materials and Manufacturing Technologies Office
ANSI	American National Standards Institute
ASCET	Advancing Standardization for Critical and Emerging Technologies
ATIS	Alliance for Telecommunications Industry Solutions
CBRN	chemical, biological, radiological, or nuclear
CDA	Copper Development Association
CERT	Computer Emergency Response Team
CET	critical and emerging technology
CSP	cloud service provider
DOE	U.S. Department of Energy
FFRDC	federally funded research and development center(s)
GPS	global positioning system
HP	Hewlett-Packard
IEC	International Electrotechnical Commission
IEEE IC	IEEE Industry Connections Program
IoT	Internet of Things
ISO	International Organization for Standardization
K-12	kindergarten to 12th grade
NAVSEA	Naval Sea Systems Command
NIST	National Institute of Standards and Technology
NSPE	National Society of Professional Engineers
NTIA	National Telecommunications and Information Administration
OT	operational technology
PaaS	platform as a service
PNT	position, navigation, and timing
QED-C	Quantum Economic Development Consortium
R&D	research and development
SaaS	software as a service

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Appendix E: Acronyms and Abbreviations

SCoE	Standardization Center of Excellence
SDO	standards development organization
SEI	Software Engineering Institute at Carnegie Mellon University
SME	small and medium enterprise
TRL	Technology Readiness Level
UAS	unmanned aerial systems

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Appendix F: Supplemental Endnotes and Comments

This section summarizes supplemental details and comments, primarily serving as annotations and elaborations on the specific standards activities proposed during Day 2 of the SCoE CET Standardization Workshop.

1 AMMTO uses and advances CETs to secure America's affordable and reliable energy technologies. Specific examples include AI tools being leveraged to accelerate qualification of additive manufacturing materials in nuclear energy; building a computational platform to scale up the next generation of smart manufacturing for directed energy deposition; and securing industrial control systems manufacturing and product life cycle from cyberattacks.

2 Biotechnology is used in several different applications such as healthcare, energy, consumer goods, and environmental biotechnology. Engineering biology at scale is now a key consideration ensuring economic and national security across nearly all sectors. Global biotechnology market value is nearing $2 trillion today and estimated to approach $4.6 trillion within the next decade.

3 For DOT, CETs have a use in safety across all modes of transportation. CETs also play a role in efficiency, reduced congestion, data sharing and analysis, interoperability, and moving research into practice. Examples include automated cranes and dock operations, intelligent transportation operations, unmanned aircraft systems (UAS) and counter-UAS activities, complementary positioning, navigation, and timing (PNT).

4 The Naval Surface Warfare Research Center is designing and building the next generation of submarines and surface ships and maintaining current systems. They require an agile supply chain that allows for more building onsite, tailored for the mission and system. For example, additive manufacturing usage on the fleet requires the right tools and the parts to be safe and long-lasting.

5 Other proposed activities related to this priority activity include:
- Categorize CETs by risk level to determine appropriate standardization rigor and timing

6 Other proposed activities within this theme include:
- Launch a U.S. "standards ambassador" initiative to advocate for U.S. interests in global standards forums

7 Other proposed activities related to this priority activity include:
- Define the business cases for successful commercialization of CETs as a precursor to standards development

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8 Other proposed activities related to this priority activity include:
- Launch standards bootcamps to help train government workers and regulators on state-of-the-art CETs
- Develop AI-based training tools for helping experts interpret requirements and properly apply standards

9 Other proposed activities related to this priority activity include:
- Track and promote standards-related career trajectories
- Encourage standards participation as a pathway for job promotions

10 Other proposed activities within this theme include:
- Support K–12 and early pipeline engagement in standards awareness

11 Additional tasks under this activity include:
- Internships: Launch apprenticeship and internship programs in CET fields through school-industry partnerships
- Curriculum: Develop a curriculum that introduces undergraduate and graduate students to the standards development process and related engineering roles
- Credentials: Introduce new credentials or certificates for standards professionals, and engage ABET to align accreditation with standards competencies in CET fields

12 Additional tasks under this activity include:
- Training modules: Create SDO-designed training modules on standards development best practices
- Accessible media content: Produce short, accessible content (e.g., videos, micro-courses)
- Mentorships: Launch a mentorship/shadowing program pairing newcomers with experienced contributors
- Standards in onboarding: Partner with employers and trade associations to embed standards training into onboarding and professional development

13 The original language for this truncated activity included the following additional details:
- Promote non-traditional, flexible, and agile standards development by lowering barriers to participation—especially for small businesses—through simplified language, alternative input methods, and proactive outreach; Encourage the use of trade associations, recognize less formal contributions, and explore ways to share standards with stakeholders who may lack traditional access or capacity to engage directly

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14 Other proposed activities within this theme include:
- Dispel misinformation through verified content and critical thinking workshops
- Publicize critical upcoming votes or decisions in standards bodies

15 E.g., Congress, the public, and other technical domains.

16 Other proposed activities related to this priority activity include:
- Develop a toolkit for understanding SDO core competencies
- Launch a public, self-reporting database for standards activities
- Develop a free, federated dictionary of standards terms across SDOs

17 Other proposed activities related to this priority activity include:
- Enable feedback and comment tracking on standards drafts and revisions
- Capture and share end-to-end use cases of standards development

18 Other proposed activities related to this priority activity include:
- Pilot digitally authored, machine-readable standards frameworks
- Establish workforce requirements and templates for standards with common testing and development frameworks

19 Other proposed activities related to this priority activity include:
- Deploy thematic workshops and tiger teams to address urgent or cross-cutting CET challenges
- Use the model pioneered by the Quantum Economic Development Consortium (QED-C) as a template for public-private collaboration

20 A participant provided the following supplemental content about a future-proof standards development framework:
- "Must be interreferential, allowing updates to all other referenced standards"

21 The original language for this truncated activity included the following additional details:
- Pilot new pathways for government standards adoption and updates—especially in highly regulated industries—by enabling faster, more flexible integration of CET standards; Focus on de-risking adoption, supporting rapid updates, and leveraging agencies like NIST to streamline feedback and implementation process

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ADVANCING STANDARDS
TRANSFORMING MARKETS

ASTM INTERNATIONAL HEADQUARTERS

100 BARR HARBOR DRIVE
P.O. BOX C700
WEST CONSHOHOCKEN, PA 19428-2959
USA

Tel +1.610.832.9500

Web go.astm.org