A National Strategy for CBRNE Standards

National Science and Technology Council
Committee on Homeland and National Security

Subcommittee on Standards

May 2011

This page is intentionally left blank.

A National Strategy for CBRNE Standards

National Science and Technology Council
Committee on Homeland and National Security

Subcommittee on Standards

ABOUT

About the Subcommittee on Standards

The National Science and Technology Council (NSTC) Committee on Homeland & National Security chartered the Subcommittee on Standards (SOS) to serve as an interagency forum to gather chemical, biological, radiological, nuclear, and explosives (CBRNE) Federal stakeholders. The interagency group is co-chaired by the Department of Homeland Security's Science and Technology (S&T) Directorate and the Department of Commerce's National Institute of Standards and Technology (NIST). It includes participants from the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, Justice, Labor, and Transportation, and the Environmental Protection Agency. The goal of the SOS is to develop a National Strategy for CBRNE Standards.

About the National Science and Technology Council

The NSTC, *http://www.ostp.gov/cs/nstc*, is the principal body within the executive branch to coordinate science and technology policy across the diverse entities that make up the Federal research and development (R&D) enterprise.

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization, and Priorities Act of 1976. OSTP's responsibilities include advising the President in policy formulation and budget development on questions in which science and technology are important elements; articulating the President's science and technology policy and programs; and fostering strong partnerships among Federal, State, and local governments, and the scientific communities in industry and academia. The Director of OSTP also manages the NSTC.

About This Document

This is the first of a number of planned publications by the SOS. The SOS brought together Federal stakeholders to develop a National Strategy for CBRNE Standards. This Strategy lays out the Federal vision and goals to achieve a comprehensive structure for coordination, establishment, and implementation of CBRNE equipment standards by 2020. These standards include those required for evaluating equipment, interoperability, training of users, and standard operating procedures for response.

Scope

This Strategy covers the need for CBRNE standards. In addition to specifying high-level goals, this Strategy identifies lead activities to accomplish these goals, and provides the foundation to bridge current gaps. As such, it establishes a structure to facilitate the coordination of CBRNE investments and activities among agency leaders, program managers, the research and testing community, and the private sector.

Applicability

This Strategy covers equipment used by Federal, State, local, and tribal responders for CBRNE detection, protection, and decontamination. Medical monitoring and diagnostic equipment, as well as equipment in the health and safety arena, are governed by specific regulatory and statutory authority.

Subsequent documents will describe a detailed implementation of this Strategy. Those documents will help facilitate interaction with and between the Nation's standards development organizations, the commercial sector, and government stakeholders to clarify roles and responsibilities, and to prioritize issues that require interagency coordination.

DEAR COLLEAGUE

EXECUTIVE OFFICE OF THE PRESIDENT
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL
WASHINGTON, D.C. 20502

May 12, 2011

Dear Colleague:

The 2011 *National Strategy for CBRNE Standards* represents the Federal consensus regarding chemical, biological, radiological, nuclear, and explosives (CBRNE) countermeasures standards. Key to the success of the Strategy is improved interagency collaboration to best manage and use the Nation's standards development, research, test, and evaluation (RDT&E) infrastructure.

This Strategy enables the creation of an implementation plan that will help determine the availability and adequacy of the RDT&E Standards infrastructure necessary to achieve the goals and objectives in the Strategy. The Strategy also lays out the Federal vision and goals to achieve a comprehensive structure for coordination, establishment, and implementation of CBRNE equipment standards by 2020. These standards include those required for evaluating equipment, interoperability, training of users, and standard operating procedures for response.

This strategy is part of the Administration's sustained emphasis on interagency planning to define and achieve high-priority national R&D goals and objectives. It highlights areas in which stronger interagency coordination will enable improved productivity from important national investments. Innovative interagency management processes and policies will assist the Federal departments and agencies in achieving the goals and objectives in the Strategy, thus contributing to the economic growth and security of the Nation while assuring its continued responsiveness to CBRNE threats.

Sincerely,

John P. Holdren
Assistant to the President for Science and Technology
Director, Office of Science and Technology Policy

Table of Contents

TABLE OF CONTENTS

Executive Summary

Emergency response teams across the Nation require reliable and interoperable chemical, biological, radiological, nuclear, and explosives (CBRNE) equipment that can be used with confidence for the protection of life, health, property, and commerce. The United States Government will, together with commercial and end-user communities, facilitate the development and implementation of national consensus CBRNE standards and establish an enduring capability to coordinate, prioritize, and implement those standards.

It is the vision of the National Science and Technology Council (NSTC) to establish and coordinate implementation of an integrated standards development approach that spans the full spectrum of standards, including performance, interoperability, test and evaluation, conformity assessment, operating procedures, training, and certification. This will assure that equipment is reliable and interoperable, and provides consistent and accurate results.

This Strategy describes the elements of a standards and testing infrastructure needed to counter CBRNE threats. The Subcommittee has consulted across the Federal government to identify research efforts and current practices with respect to performance specifications and test methods, as well as standards development needs. The Subcommittee recognizes that the CBRNE mission may be only one component of what users do each and every day. Therefore, the goals reflect not just the technical performance of the technology, but the interoperability with their suite of equipment, as well as concepts of operations involved in their deployment and the training of the users.

The following goals outline how to help achieve the vision:

GOAL 1: Establish an interagency group for CBRNE standards to promote the coordination of these standards among Federal, State, local, and tribal communities.

We must charter a single interagency group within the Federal government to coordinate standards for CBRNE equipment to ensure a robust and enduring capability for the development of validated CBRNE tools and response capabilities. Coordination of these activities by a single Federal group, with cooperation of Federal, State, local, and tribal partners, as well as industry, will help to ensure that end-users are provided with an integrated suite of standards to support CBRNE tools and response capabilities.

GOAL 2: Coordinate and facilitate the development of CBRNE equipment performance standards and promote the use of standards for Federal, State, local, and tribal communities.

We must establish an enduring process for the development and dissemination of CBRNE standards to assess current technologies and anticipate new technologies and threats. Standards for CBRNE equipment establish appropriate specifications for performance, including capability, safety, ruggedness, and the interfaces of equipment used by public and private entities in countering a variety of threats. Development and promulgation of a consistent set of voluntary consensus standards are vital to a resilient National response.

GOAL 3: Coordinate and facilitate the development and adoption of interoperability standards for CBRNE equipment.

We must develop common standards for the capture, processing, and communication of data, as well as the display and reporting of results to end-users and decision makers. This will allow timely action in the response of a CBRNE incident. Standardization of interfaces between CBRNE equipment and end-users, and between networked devices and systems, is critical to ensuring interoperability of the equipment used by Federal, State, local, and tribal communities. Interoperable equipment lowers the cost to the government in developing the technology and contributes to uniform implementation by responders.

GOAL 4: Promote enduring CBRNE standard operating procedures for Federal, State, local, and tribal use to improve National preparedness and response.

We must develop standard operating procedures (SOPs) to enable preparedness and response for CBRNE incidents at all response levels. SOPs are critical in establishing trust and confidence among response organizations during an emergency. SOPs are required at strategic, operational, and tactical levels to coordinate a successful response and inform decision making for the preservation of life, property, commerce, and continuity of government. Existing SOPs related to identifying, handling, and responding to hazardous chemical, biological, and radiological waste form the baseline for developing new SOPs for CBRNE detection, protection, and response.

GOAL 5: Establish voluntary CBRNE training and certification standards for the Federal, State, local, and tribal communities and promote policies that foster their adoption.

We must develop and adopt training and certification at the national level to ensure that all end-user disciplines are capable of responding to and recovering from CBRNE incidents. These standards should establish methods to measure capabilities of users, instructors, training centers, and agencies. Standards in training will lead to greater confidence in user performance, increased capabilities to respond to CBRNE incidents, and a framework to maintain and continue to improve those capabilities.

GOAL 6: Establish a comprehensive CBRNE equipment testing and evaluation (T&E) infrastructure and capability to support conformity assessment standards.

We must establish a testing and evaluation (T&E) infrastructure to provide common test methods, accredited test facilities, and reference materials to assess the performance of CBRNE equipment. The coordinated development and use of standard test methods in T&E across government agencies will enable the sharing of data between agencies and end-users, reduce the cost to each agency establishing its own T&E infrastructure, and promote interoperability between equipment and response capabilities. Use of these standard test methods will also facilitate uniform guidance to local emergency responders and State and local purchasing agents on the capabilities and limitations of available CBRNE equipment.

The Subcommittee releases this Strategy after extensive consultation across the Federal government. In parallel, the Subcommittee is working with the same Federal partners to identify ongoing research in the CBRNE area. This will provide the foundation for an implementation plan that will identify the gaps in CBRNE equipment standards and pathways to close them.

Introduction

Chemical, biological, radiological, nuclear, and explosives (CBRNE) agents remain a grave threat to U.S. citizens. As outlined in the 2010 National Security Strategy, there is no greater danger to the Nation than a terrorist attack with a weapon of mass destruction. The threats are myriad: the 1995 Tokyo subway Sarin attacks, the *Bacillus anthracis* attacks of 2001, multiple ricin toxin mailings, concern about unguarded nuclear and radiological material worldwide, and the attempted New York City Times Square bombing of 2010. The response to these threats has been robust – all levels of government have come together to coordinate and define capabilities from detection through response. The Nation has responded with the creation of a new Federal department dedicated to homeland security, planning and exercises spanning all levels of government, and increased research and development (R&D) across the scientific community to address the CBRNE threat. At the same time, the range of professionals involved in protecting and responding to these threats has expanded: What was once the domain of specialized military units is now shared with local first responders, including police, firefighters, emergency medical services, hazardous materials (Hazmat) response units, and bomb squads.

As outlined in the 2010 National Security Strategy (NSS), there is no greater danger to the Nation than a terrorist attack with a weapon of mass destruction.

There has been remarkable growth in the technological options as well as the number and types of equipment used by responders. However, without the defined requirements process of the military or the procurement power of the Federal government, many users of homeland security CBRNE equipment are confronted with a complex array of technical specifications, capabilities, and choices. At the same time, parallel efforts across Federal research areas in military capability, environmental monitoring and response, as well as homeland security have resulted in overlapping, if not duplicative, research efforts.

National "standards" take many forms and a suite of standards is necessary to ensure that our responders have the right tools to respond to a CBRNE incident. Regulatory standards are those promulgated by Federal agencies that have legislative authorities. For example, the maximum permissible concentrations of certain toxic chemicals and radionuclides in water are governed by the Environmental Protection Agency regulations. Regulatory standards invoke the need for other types of standards, including standard reference materials provided by the National Institute of Standards and Technology (NIST) and voluntary consensus standards for detection instruments, such as those published as National Standards by ASTM International. Standards also take other, forms, including physical standards of measurement, standard operating procedures (SOPs), training standards, and communication/interoperability standards. These standards benefit all levels of government and, more importantly, the end-user, including emergency management, public safety communications, law enforcement, bomb squads, fire service, emergency medical services, public works, governmental administration, Hazmat personnel, health care, and public health.

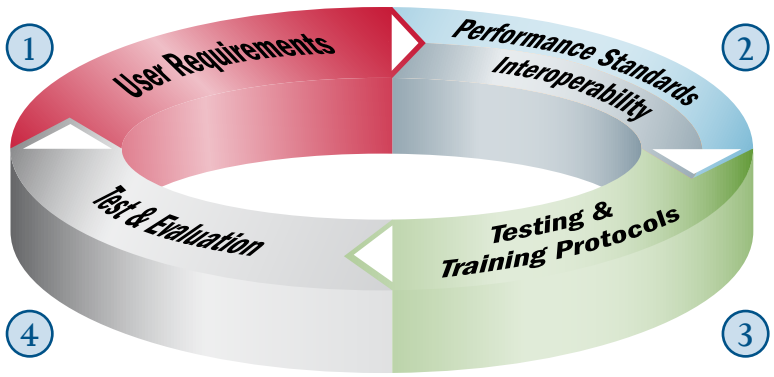
Standards for equipment provide clarity in what can be a bewildering environment of technical

specifications, technology choices, regulations, and risks. Equipment performance standards require standard testing protocols and testing facilities. Standards for testing can serve as the foundation for a conformity assessment regimen where certified laboratories test equipment using test protocols and performance standards, which provide crucial assurance of equipment capability.

Figure 1 below illustrates one way to construct a set of agreed-upon standards and conformity assessment methods whereby equipment can be tested and shown to be in conformance with standards.

and the commercial sector in order to develop consensus-based CBRNE equipment standards. Bringing together the users and the developers ensures that the requirements reflected in a given standard are balanced between what will suit the end-user's needs, what is technically feasible, and what can be achieved at reasonable costs. Stakeholder input is critical to establishing the context of use and the level of performance necessary for a given application. The forum in which the stakeholders come together for each aspect of the consensus-building process must be unbiased and sufficiently comprehensive to facilitate maximum participation.

Figure 1



There are four basic elements in a development process for equipment. The first step is establishing user requirements. The second step is converting those requirements into measureable performance specifications, and the third step is developing test methods or protocols that can be used by developers and multiple test facilities. The fourth step is to conduct the testing and evaluation (T&E) using the test protocol to evaluate the piece of equipment against the performance standard. A positive evaluation of the results can lead to a certification that the equipment conforms to the standard.

As the need for a particular CBRNE equipment capability is identified, it is essential to engage key stakeholders in Federal, State, local, and tribal governments, the responder community,

Equipment that has been tested and certified in conformance with performance standards does not ensure the capability of the user; it is just one critical part of a response capability. To ensure a robust response, the user must be trained and confirmed by certification to demonstrate competency in the use of the equipment and to demonstrate an understanding of how the equipment fits into an overall response. This requires National standards for training and certification. In addition, SOPs and response plans are needed to provide a framework to bring together the capabilities of all those responsible at the Federal, State, local, and tribal levels. This system of standards, conformity assessment, and training requires an infrastructure. This infrastructure will include facilities to test

equipment, response plans, SOPs, training, and exercises that engage decision makers as well as responders. This infrastructure can provide for the needs of many types of users – Federal, State, local, and tribal governments, first responders, and private sector users such as transit facility operators and commercial building owners.

This Strategy describes six goals that will establish an enduring standards regimen and provide for an infrastructure to test and evaluate CBRNE equipment, as well as related training and certification programs.

INTRODUCTION

Goal 1

Establish an interagency group for CBRNE standards to promote the coordination of these standards among Federal, State, local, and tribal communities.

Current Federal policies on the use of standards for CBRNE equipment, training, and response have evolved since the terrorist attacks of 2001. Numerous agencies are investing in R&D of new detection technologies and other equipment to meet mission needs. These needs range from protecting responders; to detecting CBRNE agents; to assessing the extent of cleanup following a contamination; to forensic analyses. Agencies often develop and use their own requirements and performance specifications, frequently in the absence of coordination with other agencies that have similar missions. For security reasons, some agencies keep mission requirements as *close hold* information; however, the lack of coordinated development or the use of equipment standards leads to duplication of efforts and is an inefficient use of resources. Furthermore, a lack of coordinated standards development and use continues to lead to a lack of interoperability between CBRNE equipment developed by different agencies and end-users, and impairs an efficient response to a CBRNE incident.

In order to ensure a robust and enduring capability for the development of validated CBRNE detection tools and response capabilities, a single interagency group within the Federal government should coordinate standards for CBRNE. This organization would:

- Provide guidance and cooperation on standards development and implementation among multiple Federal agencies and their CBRNE programs;
- Provide guidance to end-users at the Federal, State, local, and tribal level on equipment performance and interoperability;
- Lead the identification, promulgation, and adoption of available standards and tools;
- Perform recurring analysis to determine gaps in capabilities, standards, the performance assessment of CBRNE equipment, SOPs, and training and certification programs of users;
- Coordinate the development of needed standards and infrastructure for the assessment of CBRNE equipment and user training; and
- Facilitate agreements among Federal partners on the development and validation of CBRNE-response capabilities.

This group must also consider a Federal policy to coordinate the development and consistent use of CBRNE standards, delineate the roles and responsibilities of Federal agencies, and develop mechanisms for interaction with State, local, and tribal partners, industry, and the private-sector standards and testing communities.

The interagency group for CBRNE standards should be a standing committee at the White House level with appropriate terms of reference, charted within the National Science and Technology Council (NSTC), and should explore, with its member agencies, a governance structure – whether it is driven by a policy directive (e.g., Homeland Security Presidential Directive-22), or organized by the Office of Management and Budget (OMB) and assigned to a Federal agency, as in the case of the Federal Geographic Data Committee. The committee should be chaired by the Department of Homeland Security, with a co-chair appointed

GOAL 1: Establish an interagency group for CBRNE standards to promote the coordination of these standards among Federal, State, local, and tribal communities.

GOAL 1

from another Federal agency with specific interests in CBRNE standards. The committee should establish working groups as needed to perform its mission.

The group should establish a Federal policy to provide National performance standards for CBRNE equipment that will be purchased for wide use by Federal, State, local, and tribal agencies for their homeland security missions. This policy should be consistent with the National Technology Transfer and Advancement Act of 1995 and the OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities." Such a policy will enable agencies to support development of performance specifications based on National standards developed by voluntary consensus standards development organizations (SDOs). Agencies could then require vendors to meet or exceed these specifications as a condition of acquisition. In addition to performance standards, the interagency group should consider policy and guidance on standards for training and certification of users, SOPs, and infrastructure requirements for the assessment of equipment and training.

It is essential that this Federal interagency group establish close ties with State, local, and tribal agencies, industry, and private sector standards and testing communities. In addition, this group should engage voluntary SDOs, as well as the American National Standards Institute (ANSI), to develop and promulgate National voluntary standards for CBRNE equipment. The group should also engage formal organizations that accredit CBRNE test laboratories; e.g. the American Association for Laboratory Accreditation or the ANSI-ASQ National Accreditation Board (ACLASS), to support the full cycle of standards, testing, and conformity assessment. Coordination of these activities by a single Federal interagency group, with cooperation of other governmental agencies and industry, will ensure that end-users are provided with CBRNE equipment and capabilities that are interoperable, enable their mission, and provide actionable information.

The interagency group should maintain awareness and seek information on international standards for CBRNE equipment as well as lessons learned from our Allies or potential international partnerships that will enhance our domestic capabilities.

Goal 2

Coordinate and facilitate the development of CBRNE equipment performance standards and promote the use of standards for Federal, State, local, and tribal communities.

We must establish CBRNE equipment standards to ensure a reliable evaluation of threats, implementation of effective response strategies, and the safety of our responders and the public. While some performance standards exist for CBRNE equipment, these standards are not adequate in some areas (e.g., biological detection) and many that do exist are not appropriately used or are no longer applicable. Equipment standards are necessary to establish appropriate specifications for performance, compatibility, and interoperability of equipment used by public and private entities in countering a variety of threats. The development and promulgation of performance standards for CBRNE equipment are vital to National response readiness.

We need a baseline assessment of current CBRNE equipment performance standards to identify the existing gaps and to help prioritize future investment in standards development. The establishment of an interagency group for CBRNE standards, as highlighted in *Goal 1*, will serve to facilitate this assessment in the near-term. The interagency group should also evaluate standards development priorities on a recurring basis to address new and emerging technologies as part of an enduring system of standards development and promulgation to assure equipment performance. As a component of the assessment, the group should evaluate existing performance standards for their relevance in the current CBRNE environment. We should invest in performance standards with a solid scientific basis and applicability across a variety of technologies or systems.

If an enduring capability for the development of CBRNE standards is to be realized, the process must be streamlined, take advantage of existing expertise, and stay ahead of the technological curve. An effective process for establishing CBRNE equipment performance standards should leverage the best practices from other industry sectors, such as telecommunications, electronics, and personal protective equipment (PPE) that rely heavily on the use of performance standards. Similar to the CBRNE community, these particular industries apply performance standards that must have flexibility to adapt to the rapidly evolving rate of technology development so as to not render the standard obsolete before it is put into practice.

In order to be effective, performance standards must be realistic, achievable, and assessed in accordance with validated test methods appropriate for their intended use. The key characteristics of equipment performance standards must include, at a minimum:

- Effectiveness (e.g., response time, operating range, sensitivity, specificity, breakthrough time, and environmental effects);
- Suitability (e.g., reliability, availability, maintainability, affordability, interoperability, and manpower and personal integration); and
- Survivability (e.g., safety, utility following exposure, and ruggedness).

We must capture equipment performance standards in a format that allows straightforward evaluation by a large, diverse audience, including Federal, State, local, and tribal responders, scientists, engineers, and procurement officials. The key characteristics of technology performance must be measurable and the resulting data collected in such a way as to permit

GOAL 2

the comparative evaluation of similar equipment. The effectiveness of a performance standard and relative importance of the key characteristics are driven by its application for a specific scenario or concept of operations. There are no "one size fits all" standards.

Equipment performance standards will help protect users and produce equipment needed for CBRNE response. Reliable information on the equipment's true capabilities and operation will allow users to:

- Make more informed decisions on the procurement of equipment;
- More accurately understand the identity and level of contamination in an environment (e.g., identify safe zones);
- Make better-informed decisions regarding health and safety (e.g., PPE selection and exposure assessment); and
- Make prudent decisions about decontamination selection.

effectiveness suitability survivability

CBRNE equipment performance standards will allow greater confidence in equipment performance among the various user groups and provide greater credibility to the measurement results relayed to decision makers in the law enforcement and public health communities. As a community of developers and users, we will be able to conduct educated, comparative assessments of similar equipment.

Goal 3

Coordinate and facilitate the development and adoption of interoperability standards for CBRNE equipment.

Standardization of CBRNE equipment employed by Federal, State, local, and tribal communities requires a focus on interoperability – equipment must function within and among different jurisdictions. Devices must communicate with each other and with a variety of users – providing information to different levels of incident command. Adjacent jurisdictions may be responding to a local incident, or Federal assets may be deployed to a national incident – in both cases, devices must all work together in a secure and reliable way. The foundations of interoperability are the data and communications interfaces between the individual and the device, as well as between the networked sensors and the systems that receive and process data. Standards to support such interfaces are critical to interoperability among the variety of potential users, each with widely varying needs. Interoperability also addresses the interface between CBRNE sensors and the "upstream" information management systems that translate the individual sensor output into actionable information. Interoperable devices will better inform decision-making at all levels.

An interoperability standard describes either functional characteristics (e.g., data output or format) or physical characteristics (e.g., electrical or mechanical characteristics) necessary to allow the exchange of information between two or more devices, pieces of equipment, or systems. The widespread use and adoption of these standards will facilitate the development of "plug and play" CBRNE sensors and equipment, providing automatic, rapid, and reliable information transfer among equipment without operator intervention. With maximum outreach to Federal, State, local, and tribal communities, as well as industry, the potential of interoperability standards can be realized such that all CBRNE equipment can work in an orchestrated fashion. Figure 2 (on page 12) depicts a notional interoperable network of equipment.

Interoperability of sensor and other equipment will allow responders to easily mix other key information such as weather, traffic, and building status into the same picture of an incident, which will promote faster and more informed on-scene decisions.

Interoperability of sensors and other equipment will allow responders to easily mix other key information, such as weather, traffic, and building status, into the same picture of an incident, which will promote faster and more informed on-scene decisions. Standardizing this critical technical interface has far-reaching and strategic implications. As we move

toward a common interface, Federal, State, local, and tribal responders can integrate sensors into a common "picture" of the CBRNE incident to allow more rapid and flexible decisions during response.

There are numerous examples in current technology development that support the development of interface standards. The burgeoning web-enabled technology field is replete with demonstration and operational projects where standards have facilitated the unprecedented simple and secure exchange of critical information, including interoperable health care technology "connect-a-thons," geospatial "plug-a-thons," and the foundation work for the "smart grid" in the energy sector.

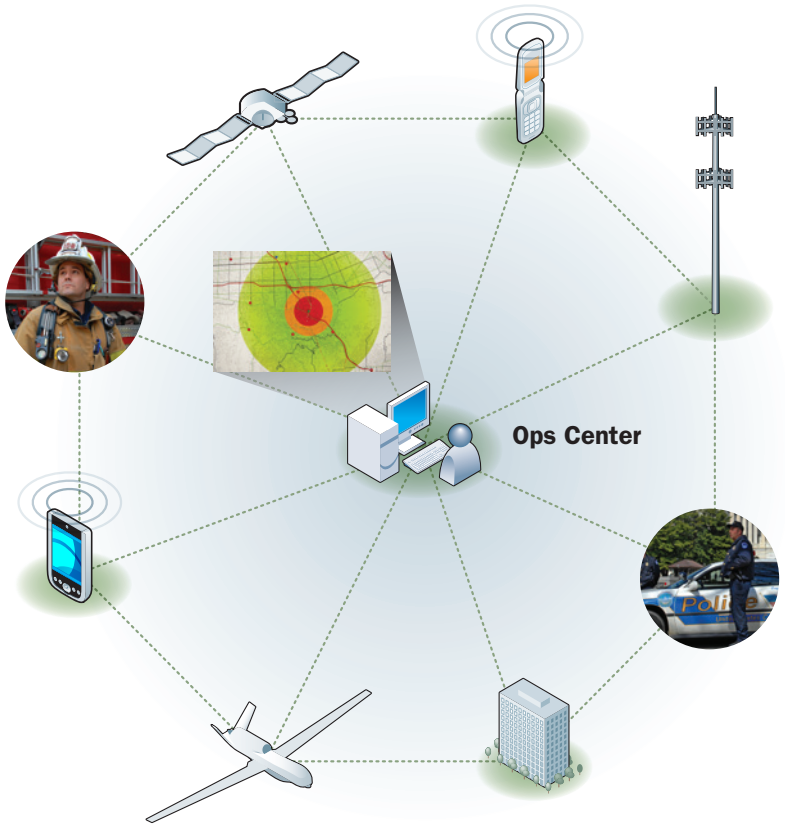
Finally, interoperability standards for CBRNE equipment lower the costs by obviating the need for each supplier to provide its own proprietary interfaces. The costs for these vendor-specific solutions are usually passed on to the agency funding the technology development and to the end-users who purchase the equipment. Interoperability standards provide a cost-effective approach to periodic upgrades to CBRNE equipment as technology or mission needs change.

GOAL 3

Figure 2

Interoperable Network

- Sensors report critical data
- Status, position, alarms
- Device data integrated with weather, traffic, fire, police and response operations
- Data provided to responders and decision makers
- Entire network of devices is secure



Goal 4

Promote enduring CBRNE standard operating procedures for Federal, State, local, and tribal use to improve National preparedness and response.

We must be prepared to support State, local, and tribal jurisdictions with relevant predictable resources at the point of need at the time of a CBRNE incident. SOPs are critical in establishing trust and confidence among response organizations during an emergency. SOPs are required at the strategic, operational, and tactical levels to coordinate a successful response and to inform decision making for the preservation of life, property, commerce, and the continuity of government. Timely delivery of resources to meet support requirements must be based on operational plans tailored to the specific hazard. Further, SOPs link the detection of a hazard in time, space, and concentration, which enables effective decisions for public safety and public health. Currently, few SOPs truly transcend the individual applications for which they were written to provide a means of coordination across multiple response organizations. Without SOPs, the Nation's ability to respond in large-scale incidents efficiently and effectively is severely hampered.

The National Response Framework establishes a single, comprehensive framework for the management of domestic incidents. Coordination of operations is critical for resource delivery, technology integration, and exercises for the development of best practices. Activities should be coordinated across Federal agencies to support exercises at all levels, gather lessons learned, and evaluate best practices. This coordination function must be used to distill common elements of procedures from across the Nation into basic standardized procedures relevant to the users and decision-makers. Harmonization of SOPs among CBRNE incident types should be conducted routinely to enhance the distribution of relevant lessons learned. Industry must also be informed of best practices to shorten development cycles of future equipment improvements that enhance response.

Existing SOPs for response to hazardous chemical, biological, and radiological waste form a baseline of SOPs for CBRNE response, which includes defining the requirement for hazard identification. Development of additional SOPs, however, is needed to enable preparedness and response for CBRNE incidents at all response levels. The envisioned process for SOP development would interface Federal agencies with State, local, and tribal governments and nongovernmental organizations to evaluate existing standards, where available. They would also develop new SOPs to enable public safety and public health decision making during a CBRNE incident.

Well-coordinated operating procedures can facilitate the Nation's response at all levels. The strategic vision for the development and integration of SOPs for improved National preparedness and response includes:

- Promotion of Federal stewardship in the development and integration of SOPs;
- Coordination between agencies and operations at all levels; and
- Leveraging and expanding existing SOPs.

Interagency leadership is critical to the development, promotion, and distribution of SOPs that represent best practices across the response community. The establishment of an interagency CBRNE standards group, as highlighted in *Goal 1*, should provide an operational baseline for the gap assessment of

Goal 4: Promote enduring CBRNE standard operating procedures for Federal, State, local, and tribal use to improve National preparedness and response.

existing SOPs, and recommend a prioritization for the development of new SOPs based on type of threat. The stakeholder community can utilize the gap assessment to define and develop needed SOPs while accounting for the equities of all relevant agencies and departments. Promotion and distribution of SOPs can be achieved through inclusion of Federal, State, local, and tribal-level response planners in SOP development, and by efforts to provide education through workshops and training exercises.

Though operational procedures may vary across the Nation and are specific to the operational levels for which they are written, standardization among the common elements of these procedures alone can enable a unified response. We must involve stakeholders in the standards development process. Consensus achieved on elements common to multiple stakeholders will lead to SOPs that will have relevance at all levels and that can be utilized to communicate and coordinate activities across governmental and non-governmental organizations.

Goal 5

Establish voluntary CBRNE training and certification standards for the Federal, State, local, and tribal communities and promote policies that foster their adoption.

Training is the foundation that builds, improves, and sustains our CBRNE capabilities. Standards are vital for confidence, acceptance, and interoperability of responders and equipment and thus must be further integrated into the current training regimen. Training establishes and improves user capabilities and confidence, leading to quicker, robust, and effective responses to CBRNE incidents. Standards in training will lead to greater confidence in user performance, increased capabilities to handle known and unknown CBRNE incidents, and an enduring model to maintain and improve those capabilities.

Policies to support the adoption of standards are essential to success.

Currently, training is facilitated by reference to multiple standards (e.g., National Fire Protection Association [NFPA] 472, NFPA 473 and Occupational Safety & Health Administration 1910.120) as general guidelines in CBRNE courses. It is recognized that current standards are discipline-centered (e.g., law enforcement, public works, emergency management, public health, etc.) and do not cover all the duties related to a CBRNE incident. Similarly, there is minimal integration of the specialized CBRNE skills and/or CBRNE equipment with the day-to-day duties of most users, either in training or in practice. As a result, there are disparities in the capabilities and knowledge of CBRNE across the user community.

In order to address these gaps, we must examine current training standards and associated policies. Training standards should establish methods to assess the capabilities of users, instructors, training centers, and agencies. These capabilities should be tightly coupled to standards for operational performance, technical knowledge, and ability to help others increase their capabilities. The key aspects of training standards should include:

- Capability levels (e.g., apprentice, journeyman, and master);
- Preparedness (e.g., operational experience, integration into everyday activities, teamwork, mental readiness, technical knowledge, and equipment knowledge); and
- Learning models (e.g., academic, tabletop, scenario-based drills, exercises, mentoring, and on-the-job).

Policies to support the adoption of standards are essential to success. Federal agencies responsible for operational CBRNE duties must lead the development and adoption of training standards. We must foster and utilize partnerships with nationally recognized stakeholder organizations, user training academies, academic institutions, and industry in the development of the standards and their promulgation. The successful integration of training standards can be evaluated through operator proficiency testing and operational exercises, and such evaluation opportunities must be available to the response community. Proficiency test programs, standards, and reference materials must be created and implemented. Processes must be put in place to track the usage of these standards as a group,

Goal 6

Establish a CBRNE equipment test and evaluation (T&E) infrastructure and capability to support conformity assessment standards.

identify gaps and issues, and maintain relevancy. The Strategy outlined above calls for Federal agencies, through an interagency forum, to harmonize equipment standards, SOPs and training. This harmonization must include efforts to standardize test methodologies and encourage the coordinated development of a validated T&E infrastructure for CBRNE systems. Interagency harmonization will enable the leveraging of limited T&E resources, while providing the data required for user confidence in CBRNE systems. The promulgation of standard test methods, with the necessary infrastructure to support certification testing, will enable CBRNE equipment users to purchase equipment tested by qualified laboratories. National standards coupled with test methods will provide clear performance targets for manufacturers, straightforward guidelines for granting authorities, and clearer choices for procurement by users—be they Federal, State, local, or tribal.

Limited standardization of test methods and facilities in the CBRNE community results in costly redundancy in the development of new test facilities, infrastructure, methodologies, and tests performed. This dearth of test standardization among government agencies and contractors has resulted in the purchase of equipment that has not met government agency mission needs; or has resulted in the government re-testing items because of low confidence in the test data.

The development of interagency T&E standards has some hurdles, including differing missions that translate to important differences in test methodologies (e.g., civilian vs. military equipment use). Varying missions among government agencies yield important differences in CBRNE test methodologies and infrastructure. For example, while a warfighter and a first responder both require protective equipment for potential chemical and biological threats, a warfighter may be required to stay in the equipment for 24 hours or more, whereas a first responder may wear it for 30 minutes. This translates into major differences in the requirements for this type of equipment, and differences in the test methodologies and infrastructure required for testing to these requirements. These varied missions also provide opportunity—considerable progress has been made in the development of T&E standards by individual agencies, and these lessons learned can be leveraged to accomplish interagency T&E standards for all types of CBRNE equipment.

To promote interagency standardization for CBRNE T&E, the interagency group described in *Goal 1* will need to act as a forum to resolve issues unique to the area of T&E. There is currently no consistent T&E terminology across both government agencies and SDOs. In addition, there is restricted test method accessibility, a lack of reference materials, and limited certification of test personnel and facilities. These issues are outlined below:

Terminology. Currently, agencies use different definitions and criteria for terms such as T&E, standards, performance standards, test methods, verification, validation, accreditation, and certification.

Test Methods. CBRNE equipment test methods are often developed by government agencies and SDOs for use in T&E laboratories that have special facilities for handling chemical and biological agents, explosives, and Special Nuclear Materials. These test methods have

often been considered proprietary information of the test laboratories, making T&E standards documentation difficult. In some cases, the test methods and supporting data may be classified, although it is more common that the results of individual tests are classified rather than the test methods themselves.

Reference materials. Reference materials are used to verify the accuracy and precision of CBRNE equipment, validate T&E infrastructure and testing methodologies, and for operator proficiency testing. These materials are required to ensure accurate test data for CBRNE systems. In a few instances, government agencies can use reference materials, i.e., Standard Reference Materials from NIST, or certified reference materials from the Centers for Disease Control and Prevention. In many cases, however, reference materials for CBRNE testing are not agreed upon even within individual agencies.

Certification. "Certification" is a general term that is not used uniformly by Federal agencies. Certification can apply to specific test methods and to entire laboratory operations. In some cases, certification is required by legislation; in other cases, it is simply a statement made by an independent organization (or agency) that a product has been tested and shown to be in compliance with a standard. International Organization for Standardization (ISO) 17025, an international standard for laboratory management, requires a quality management system and provides agencies some assurance about basic laboratory management and operations. Across the CBRNE enterprise, there has been a variable application of certification in laboratories. Along with large scale commercial test laboratories, some Federal test facilities are, for example, moving to obtain certification to ISO 17025 compliance.

Individual agencies have made progress in the development of standards and standard T&E methods specific to their mission space. The interagency group established in *Goal 1* should leverage this investment for the development of interagency T&E standards. Specifically, the interagency group should:

- Develop common T&E interagency terminology and definitions;
- Coordinate transparency and accessibility of CBRNE test methods across government agencies and SDOs;
- Review existing reference materials for CBRNE testing and identify gaps for reference materials needed by a large range of users – Federal, State, local, and tribal; and
- Support designated certification of all test facilities that will provide data to be used by the government.

Development, coordination, acceptance, and use of T&E standards across government agencies and SDOs will allow data to be shared among agencies and users. This should reduce the high cost of CBRNE testing that results from the hazards associated with handling CBRNE materials. It will facilitate uniform guidance to local emergency responders and State and local purchasing agents on the capabilities and limitations of commercial CBRNE systems. Furthermore, it will provide major cost savings for the government through reduced test redundancy, the sharing and leveraging of test facilities and infrastructure, and the acceleration of CBRNE acquisition program schedules.

Path Forward

To confidently prepare for and respond to CBRNE incidents, Federal, State, local, and tribal governments must be guided and supported by standards. Standards for CBRNE range from standards for equipment performance, interoperability, operating procedures, and training and certification of responders, to the test and evaluation of CBRNE equipment.

This document describes an enduring National Strategy for CBRNE Standards. While the Subcommittee has been drafting this document, a parallel effort has been underway to survey Federal efforts in CBRNE equipment

> This will be a great challenge, requiring the coordination and active participation of multiple Federal, State, local, and tribal agencies, industry, the private sector standards and testing communities, and many others.

R&D and use, including the development and use of associated standards. The data from the survey will be used to facilitate the development of a supporting implementation plan to execute this Strategy. Furthermore, it will provide an understanding of remaining gaps in the development and use of standards by the Federal government.

The National Strategy for CBRNE Standards will be implemented in synergy with current or future United States Government (USG) strategies and initiatives that refer to or have a bearing on standards development. CBRNE threats recognize no national boundaries, and it is important that the USG coordinate with partner countries to work toward the convergence of standards for CBRNE equipment to support interoperability across national borders.

This will be a great challenge, requiring the coordination and active participation of multiple Federal, State, local, and tribal agencies, industry, the private sector standards and testing communities, and many others. Multiple funding streams, unique mission requirements, and the need to establish an integrated and cohesive infrastructure are challenges. Strong leadership by the interagency group established in *Goal 1* is critical to the successful implementation of this Strategy to provide the needed standards to support the Nation.

PATH FORWARD

Appendix

Acronyms

ACLASS – ANSI-ASQ National Accreditation Board

ANSI – American National Standards Institute

CBRNE – Chemical, Biological, Radiological, Nuclear, and Explosives

ISO – International Organization for Standardization

Hazmat – hazardous materials

NFPA – National Fire Protection Association

NIST – National Institute of Standards and Technology

NSTC – National Science and Technology Council

OMB – Office of Management and Budget

OSTP – Office of Science and Technology Policy

PPE – Personal Protective Equipment

RDT&E – Research, Development, Test, and Evaluation

R&D – Research and Development

SDO – Standards Development Organization

SOP – Standard Operating Procedure

SOS – Subcommittee on Standards

T&E – Testing and Evaluation

USG – United States Government

S&T – Science and Technology

Report Contributors

Committee on Homeland and National Security
Co-Chairs

Tara O'Toole
Under Secretary for Science and Technology
Department of Homeland Security

Zachary Leminos
Assistant Secretary of Defense for Research and Engineering
Department of Defense

Philip Coyle
Associate Director for National Security and International Affairs
Office of Science and Technology Policy

Executive Secretary

Mary Hanson
Director, Advisory Committee/ Executive Branch Liaison
Science and Technology Directorate
Department of Homeland Security

Subcommittee on Standards
Co-Chairs

Bert Coursey
Director
Standards Branch
Test & Evaluation and Standards Office
Science and Technology Directorate
Department of Homeland Security

Lisa Karam
Chief, Ionizing Radiation Division
Physical Measurement Laboratory
National Institute of Standards and Technology
Department of Commerce

OSTP Representatives

Franca Jones
Office of Science and Technology Policy

Peter Emanuel
Office of Science and Technology Policy

Executive Secretary

Tod Companion
Department of Homeland Security

REPORT CONTRIBUTORS

Subcommittee on Standards continued

Agency Principle Representatives

Steve Binkley
Department of Energy

Duane Caneva
Homeland Security Council

Ken Cole
Department of Defense

John Decker
National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention

Thomas Galassi
Department of Labor

Benjamin Garret
Federal Bureau of Investigation

Peter Jutro
Environmental Protection Agency

Philip Mattson
Department of Homeland Security

Stephen Patrick
Federal Bureau of Investigation

Gabriel Ramos
Technical Support Working Group

Jean Reed
Department of Defense

Caird Rexroad
United States Department of Agriculture

Robin Robinson
Department of Health and Human Services

James Spahr
National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention

Former Members

George Gray
Environmental Protection Agency

Chris Olson
Department of Defense

Phillip Rankin
Department of Defense

Clifton Stine
Department of Defense

Mike Walter
Department of Defense

REPORT CONTRIBUTORS

Strategy Working Group Members
Co-Chairs

Matthew Davenport
Department of Homeland Security

Emma Wilson
Department of Defense

Executive Secretary

Jennifer Marshall
National Institute of Standards and Technology

Participants

Douglas Anders
Federal Bureau of Investigation

William Billotte
National Institute of
Standards and Technology

Rebecca Blackmon
Technical Support Working Group

Donna Boston
Department of Health and Human Services

Lance Brooks
Department of Homeland Security

Denis Campeau
Department of Homeland Security

Pam Chu
National Institute of
Standards and Technology

Rick Dickson
Department of Homeland Security

Brendan Doyle
Environmental Protection Agency

David Ferris
Department of Defense

Mark Flohr
Department of Defense

John Koerner
Department of Health and Human Services

Eric Koglin
Environmental Protection Agency

Kang Lee
National Institute of
Standards and Technology

Laurie Locascio
National Institute of
Standards and Technology

Dino Mattorano
Environmental Protection Agency

REPORT CONTRIBUTORS

Strategy Working Group Members Participants continued

J. Clay McGuyer
National Guard Bureau
Department of Defense

Jayne Morrow
National Institute of
Standards and Technology

Charles Pixley
Department of Agriculture

Jason Roos
Department of Defense

Marc Salit
National Institute of
Standards and Technology

Roxanne Shively
Department of Health and Human Services

Deborah Shuping
Department of Defense

David Smith
Department of Defense

Tammy Taylor
Office of Science and Technology Policy

Eileen Thacker
Department of Health and Human Services

Juan Vitali
Department of Defense

Others Assisting in Preparation of this Report

Jane Baker
Booz Allen Hamilton

Kerrie DeMarco
Department of Defense

Kakoli Kim
Booz Allen Hamilton

Rebecca Maag
Booz Allen Hamilton

Nicholas Shahan
Booz Allen Hamilton

Geraldine Smidt
Strategic Analysis

This page is intentionally left blank.