



# NIOSH's National Personal Protective Technology Laboratory: Providing Personal Protective Technology Innovations for the 21st Century



**DEPARTMENT OF HEALTH AND HUMAN SERVICES**  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health





*Julie Gerberding, M.D.*

*My recent visit with the management and employees of the NIOSH National Personal Protective Technology Laboratory convinces me that it is heading in the right direction to achieve “excellence in science, excellence in providing services to the public, and excellence in strategic processes.”*

Paraphrased from a speech by  
Dr. Julie Gerberding, Director of the CDC

**NPPTL**

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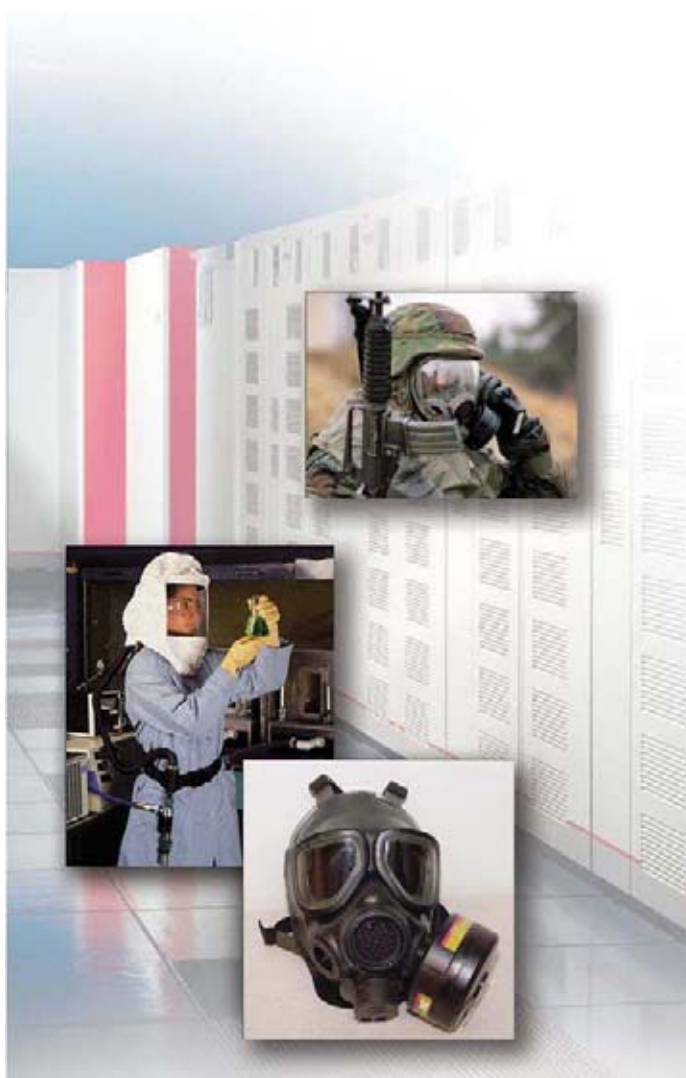


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## Abbreviations

<b>BLS</b>	Bureau of Labor Statistics	<b>NASA</b>	National Aeronautics and Space Administration
<b>AFGE</b>	American Federation of Government Employees	<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>CDC</b>	Centers for Disease Control and Prevention	<b>NIST</b>	National Institute of Standards and Technology
<b>CBRN</b>	chemical, biological, radiological, and nuclear	<b>NPPTL</b>	National Personal Protective Technology Laboratory
<b>CRADA</b>	cooperative research and development agreement	<b>OSHA</b>	(U.S.) Occupational Safety and Health Administration
<b>DHS</b>	(U.S.) Department of Homeland Security	<b>PPE</b>	personal protective equipment
<b>DOD</b>	(U.S.) Department of Defense	<b>PPT</b>	personal protective technologies
<b>DOE</b>	(U.S.) Department of Energy	<b>PRL</b>	Pittsburgh Research Laboratory
<b>FY</b>	fiscal year	<b>QA</b>	quality assurance
<b>IDP</b>	Individual Development Plan	<b>RDECOM</b>	(U.S. Army) Research, Development, and Engineering Command
<b>ISO</b>	International Organization for Standardization	<b>SCBA</b>	self-contained breathing apparatus
<b>LANL</b>	(DOE) Los Alamos National Laboratory		
<b>MSHA</b>	Mine Safety and Health Administration		

# From the Director of NIOSH



*John Howard, M.D.*

## **NPPTL Mission:**

*To prevent work-related injury and illness by ensuring the development, certification, deployment, and use of personal protective equipment and fully integrated, intelligent ensembles.*

## **NPPTL Vision:**

*Be recognized for delivering prototypes and standards of fully integrated, intelligent ensembles for the protection of emergency responders, firefighters, and miners and healthcare, agricultural, and all other workers.*

The NIOSH National Personal Protective Technology Laboratory (NPPTL) is at the forefront of the Nation's efforts to prevent work-related injury and illness by ensuring the development, certification, deployment, and use of personal protective equipment (PPE) and fully integrated, intelligent ensembles. We focus expertise from many scientific disciplines to advance Federal research on respirators and other personal protective technologies (PPT). Our efforts are essential for applying state-of-the-art science to meet the increasingly complex occupational safety and health challenges of the 21st century.

NPPTL's strategic research program will ensure that the development of new PPE keeps pace with employer and worker needs as work settings and worker populations change and as new technologies emerge. Emerging technologies include (1) personal protective devices such as improved respirators, chemical-resistant clothing, hearing protectors, and safety goggles and glasses; and (2) devices that provide a worker with early warning of a hazard, such as sensors that detect toxic atmospheres, and communication devices used for safe deployment of emergency workers.

Our research also responds to the critical need for effective PPE and PPT for responders during and following terrorist events and other man-made or natural disasters.

The fundamental framework for our planning activities is the criteria defined by the Baldrige National Quality Program with a focus on achieving the objectives of the President's Management Agenda. Though primarily developed for use by private-sector organizations, the seven Baldrige Criteria for Performance Excellence can be effectively applied to public organizations, such as the NPPTL.

The heart of our strategic plan is the set of seven strategic objectives and the supporting key activities. These describe the major features of our roadmap for (1) conducting and managing our research program, and (2) defining and implementing our advanced protective strategies.

In fiscal year (FY) 2001, the U.S. Congress allocated funds to develop standards and technologies for protecting the health and safety of America's workers who rely on PPE, such as respirators, clothing, gloves, hard hats, and eye and hearing protective devices. The Centers for Disease Control and Prevention (CDC) and NIOSH established the NPPTL in Pittsburgh, PA, to provide national and world leadership for improved PPT.

The critical need for PPE use criteria became especially evident in the aftermath of the terrorist events of September 11, 2001. The sustained response required for such an event has significantly changed PPE protection requirements. In FY 2002, NPPTL established laboratory facilities and developed standards for self-contained breathing apparatus (SCBA) units intended for use in chemical, biological, radiological, and nuclear (CBRN) environments.

An organizational plan was implemented in partnership with the bargaining units representing Laboratory employees. The plan described the NPPTL structure, unit functions, and staffing requirements. Employee placement in the new structure was conducted through a labor/management partnership.

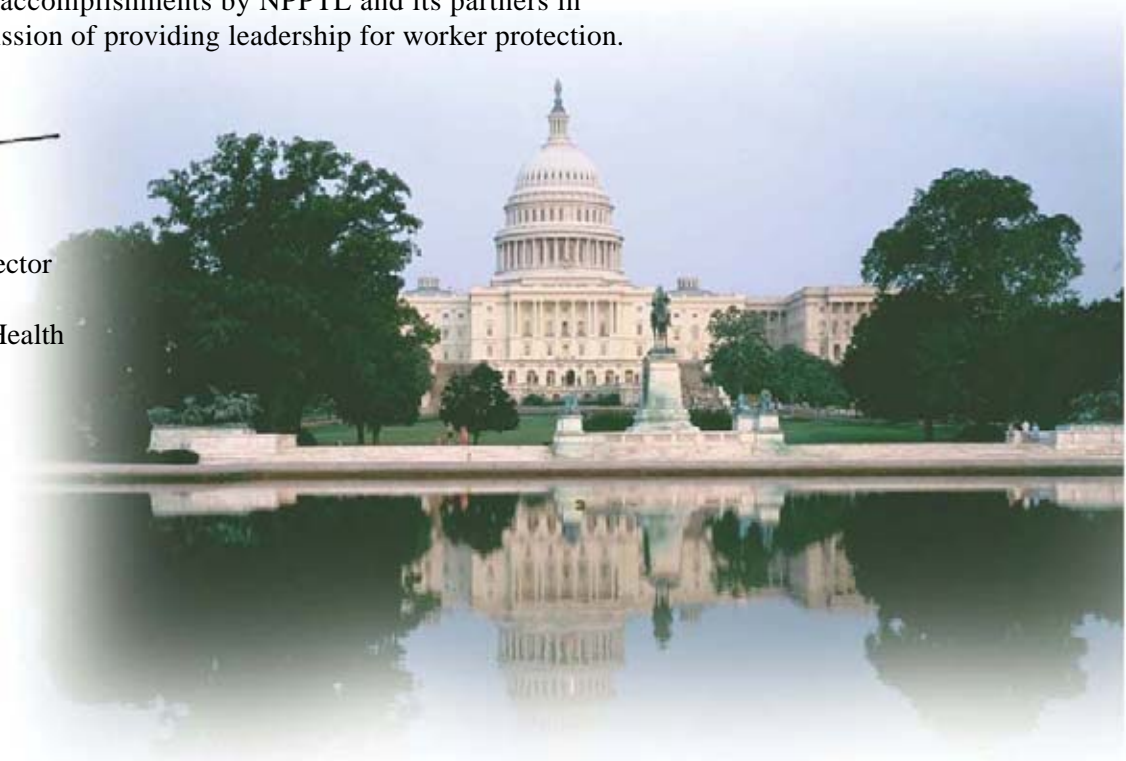
Renovation of ten existing structures, borrowed from the NIOSH Pittsburgh Research Laboratory (PRL) to temporarily house laboratories and staff, was completed in early 2003. The transition from Morgantown, WV, to Pittsburgh of respirator research and certification programs, as well as research on protective gloves, was done in partnership with the bargaining units at both sites. Also transferred to NPPTL was the self-contained self-rescuer (respirator) program, formerly part of the PRL mining research program. All current employees affected by the transition have been satisfactorily placed.

A master plan was developed for a world-class facility in Pittsburgh that could integrate all NPPTL laboratory and office activities into one building. Presently available space (even after all renovations are complete) limits some activities in the short term, such as some new research (e.g., real-time sensor research) and surveillance. NPPTL is partnering with other government organizations, academia, and private sector entities to address these areas.

I look forward to further accomplishments by NPPTL and its partners in supporting the NIOSH mission of providing leadership for worker protection.



**John Howard, M.D.**, Director  
National Institute for  
Occupational Safety and Health



*Photo: United States Capitol, Washington, DC*

# From the Director of NPPTL



*Richard Metzler, Director*

## NPPTL Founding Principles

Provide swift and effective response to emerging hazards and deployment of innovative technologies.

Use integrated management systems to achieve organizational and operational excellence.

Use an integrated systems approach to technology development to produce PPE that makes a difference.

Form quality partnerships to enhance the safety and health of all workers.

## Laboratory Description

NPPTL's resources include staff with world-recognized PPT expertise and facilities specifically equipped to carry out our mission. Staff possess unique expertise and experience in PPT research and development, respiratory protection technology, including metabolic and breathing simulation, open and closed circuit SCBA testing, and respirator testing using particulates, gases, and vapors.

To achieve our mission, NPPTL:

- Conducts work site surveillance of hazards for which PPT and PPE are used to protect workers, along with studies of patterns of PPT use.
- Conducts laboratory and field research on the development and evaluation of innovative PPT and PPE.
- Researches and develops criteria, standards, and guidelines relating to PPT performance, quality, reliability and efficacy.
- Directs and carries out the NIOSH respirator certification program and related laboratory, field, quality, and records activities.
- Produces and disseminates research findings, technical information, training materials, performance criteria, and recommendations for using PPE to improve worker protection.
- Develops, studies, and assesses the effectiveness of communications and training approaches and technologies relating to PPT.

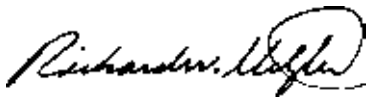
NPPTL's four scientific focus areas are:

1. **Respiratory Protection:** Fill gaps in knowledge, methods, and measures for new NIOSH respirator performance, quality, and reliability standards; and provide recommendations for improving respiratory protection for a diverse user population.
2. **Ensembles:** Use a systems engineering approach for the design, development, evaluation, and integration of new technologies and performance, quality, and reliability standards for PPE ensembles. User communities, such as emergency responders, firefighters, mine workers, and health care workers, will have unique PPE ensembles developed specifically to protect against known occupational hazards. Ensembles will be reviewed frequently for appropriateness to emerging hazards.
3. **Human Performance:** Conduct studies designed to measure human physiological, biomechanical, cognitive, and exercise performance responses to wearing PPE and PPE ensembles, and then modify the ensembles to improve human performance.
4. **Sensors:** Develop, evaluate, and integrate effective residual life indicators and predictive models for protective clothing and respirators into PPE ensembles.

NPPTL's products and services include:

- Peer-reviewed scientific research studies, analyses, and reports to fill PPT knowledge gaps.
- Standards for advanced PPT to assure appropriate system and guidance to workers.
- Evaluations of technologies and recommendations for use.
- Approval of respirators meeting NIOSH certification standards.
- Quality assurance (QA) and compliance investigations triggered by suspected malfunctions of NIOSH-approved respirators.
- Technical assistance and advice to regulating agencies, leading to improved science-based enforcement standards.
- Policies for product certifications and standards.
- Training and education.
- User guidance documents (safety alerts, guidelines).

We strive to make a difference for American workers and emergency responders who rely on the personal protective equipment we are developing to keep them safe and healthy on the job.




**Richard Metzler**, Director  
NIOSH, National Personal Protective  
Technology Laboratory

NPPTL Scientific Focus Areas

### Scientific Focus Four Primary Areas

- **Respiratory Protection**
- **Ensembles – Fully-integrated and intelligent**
- **Human Performance – Capabilities with / without PPE**
- **Sensors – Technology Development**



# Business Management

## Values

*Many of the challenges our Nation is facing are strategic opportunities for the National Personal Protective Technology Laboratory to excel.*

NPPTL accomplishes its mission through the efforts of competent personnel working in partnership with our stakeholders to achieve quality results. We are guided in our activities and actions by the organizational principles and values described below. These were derived from the Values Statement of the NIOSH 2004-2008 Strategic Plan and with substantial input from all NPPTL employees through several training seminars that were held on the planning activity.

**Quality.** We utilize the best science, the highest level of data quality, and the most transparent peer review. We solicit independent and critical review of our products and services to improve the quality of our science. Quality results from empowerment.

**Relevance.** We continually strive to ensure that what we do is relevant to those we serve. We seek program assessments from our partners, stakeholders, and customers.

**Performance.** We set goals for what we want to achieve, and establish measures and targets to gauge our progress. We link accountability, performance, and professional behavior.

**Accountability.** We are accountable for our actions and for the quality of our products and services. We are accountable to each other and to our stakeholders so that together we advance NPPTL objectives.

**Partnership.** We accomplish our mission in partnership with industry, Federal and state governments, and scientific and professional communities. We trust our partners, internal and external. We strongly believe that quality partnerships improve safety and health.

**Access.** Our customers obtain useful products and services through expanded traditional and electronic access. We will provide our stakeholders the information they need through the access mechanisms they prefer.

**Diversity.** Our employees reflect the full spectrum of diversity found in the American work force, and our programs reflect the diversity of solutions needed for the American workplace. We operate on the premise that “one size does not fit all,” and are respectful of everyone and every opinion.

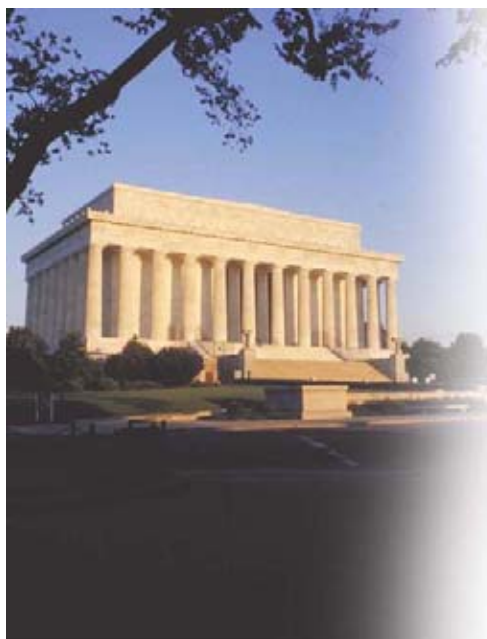


Photo credit: Lincoln Memorial by Ken Hammond, U.S. Department of Agriculture





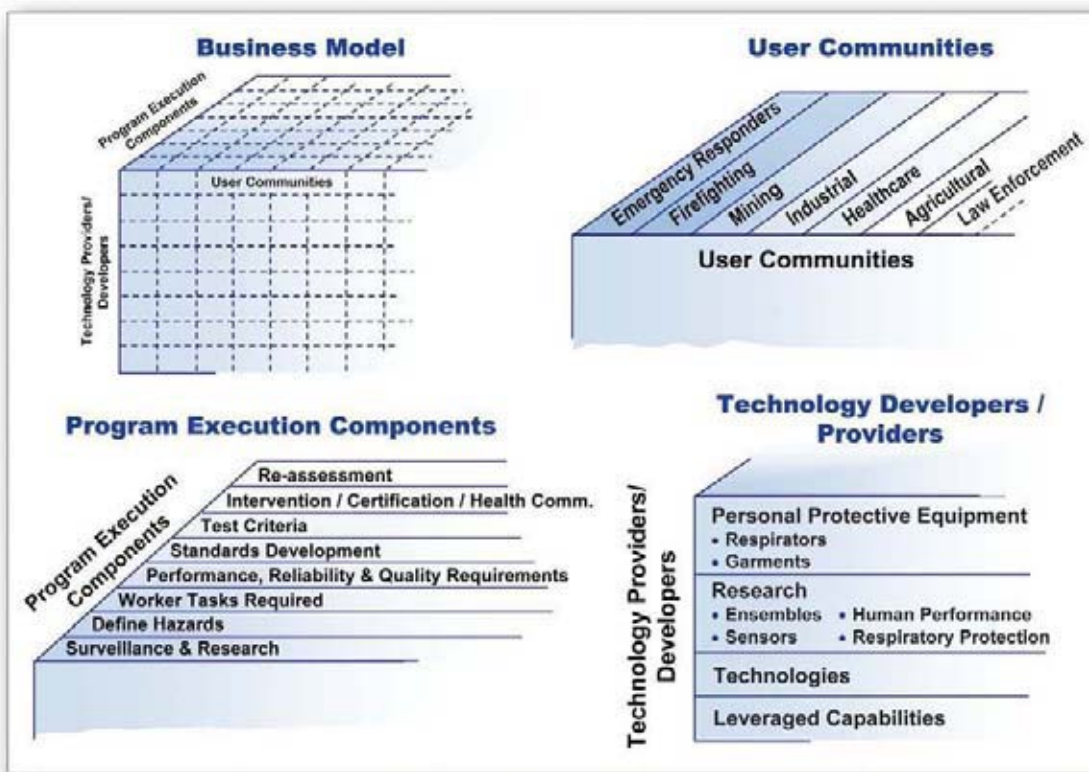
The NPPTL Human Resource Model—Strategic Management of Human Capital

## Human Resources

NPPTL's most important asset is its employees (or "human capital," as this resource is described in the President's Management Agenda). The human resource model above depicts the approach NPPTL is taking to obtain the required knowledge, skills, and abilities to meet its responsibilities. At its center are the Federal employees with NPPTL core competencies. The Laboratory was initially staffed with highly qualified individuals from existing NIOSH divisions. The original NIOSH staff has been augmented by transfers from other government organizations and through hiring from the private sector. Private sector recruits (including senior managers) bring different perspectives.

By design, non-Federal human resources are matched to priority and "non-inherently governmental" functions. By managing NPPTL human resources in this way, a strong emphasis is placed on government leadership rather than government ownership. This will engender low turnover in governmental expertise, and permit the flexibility to rapidly adapt to change through partnerships and a complementary, commercial workforce. We rely heavily upon the capabilities of external partners. This means resources can be swiftly reallocated to address emerging personal protective needs and effect appropriate solutions. Our partnerships focus a strong national alliance on stakeholder PPT safety and health needs, which will result in a credible and productive national laboratory.

*Photo credit: Flags at the Washington Monument by Ken Hammond, U.S. Department of Agriculture*



The NPPTL Business Model

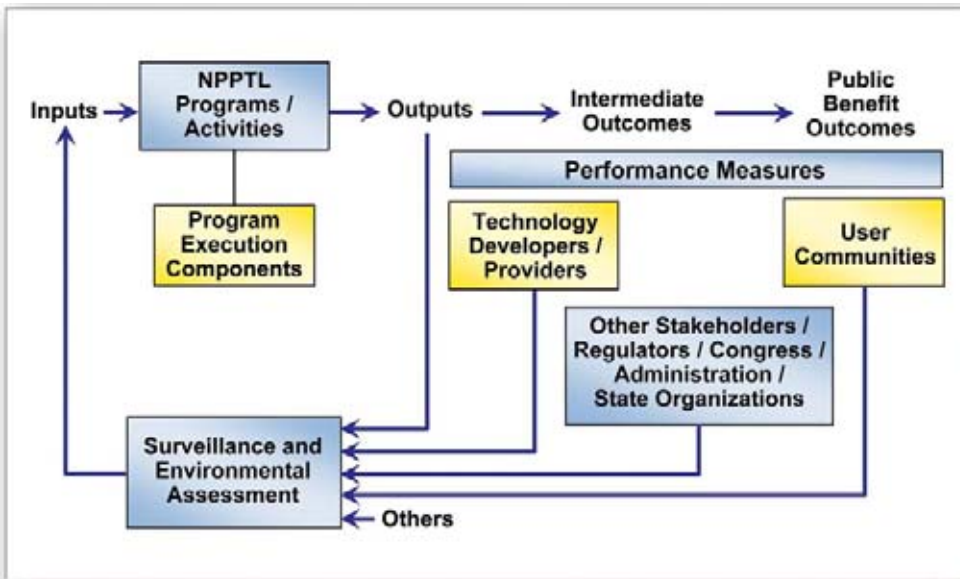
## Business Model

The NPPTL business model highlights the importance of partnerships with key stakeholders for the definition, execution, and ultimate success of its programs.

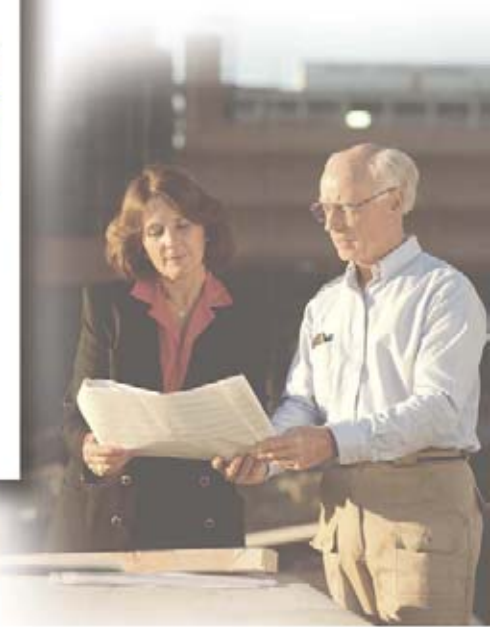
NPPTL programs are defined with input and guidance from user communities to address their PPE needs. These needs become the targets for NPPTL’s research, advanced protective strategies, and surveillance activities. These activities are aligned with NPPTL program execution components, and the Laboratory manages its funding and other resources through these components. The capabilities of technology developers and suppliers are augmented by in-house core competencies.

The entire process is iterative, so that the needs, capabilities, and programmatic accomplishments are constantly monitored and immediately shared. In this manner, these jointly developed program definition and execution efforts remain sensitive and responsive to changing circumstances.

This business model is also the basis for NPPTL’s information system, which supports business partners and collaborative programs, and is currently under development. Individual “cells” in the business model will be the core units upon which the information system will be built. Thus, information will be readily available for internal management use, and, as appropriate, be directly accessible by partners and stakeholders. Examples of such information include resource allocations on a project or program basis, budgets associated with partnerships and contracts, funding associated with key technology developments, costs associated with capital investments, personnel costs related to specific programs, stakeholders associated with a specific ensemble development, and stakeholder input related to a specific standard development. This model also permits the monitoring of Laboratory progress in meeting programmatic objectives through various program execution components.



NPPTL Value Creation System



## Value Creation System

The Baldrige Criteria place specific emphasis on defining, measuring, and improving the performance of an organization's key value creation processes. NPPTL's Value Creation System revolves around outputs, intermediate outcomes, and public benefit outcomes through the execution of its business model. Outputs (products and services) are the direct results of NPPTL's activities, and include peer-reviewed publications, protective equipment standards, and respirator certification approvals.

Outcomes are the benefits derived through the use of products and services. Intermediate outcomes are the series of benefits that occur through the partnerships formed with NPPTL's technology developers and suppliers. A marketplace with a wider selection of NPPTL-certified respirators is an example, and this wider selection can be used as a measure of success. Private sector incorporation of NPPTL-developed advanced technologies into certified PPE and PPE ensembles that provide higher levels of worker protection is another. The citation of NPPTL-certified products in other Federal standards is a third example of an intermediate outcome.

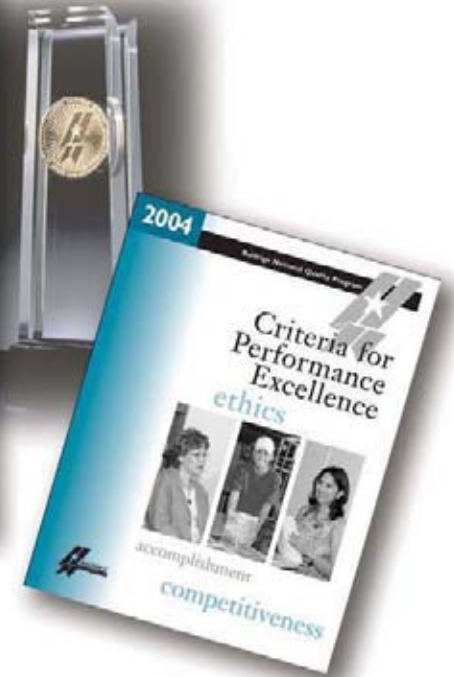
We can measure the effectiveness of our efforts and contributions through risk assessment analyses and demonstration projects. That is, risk assessment analyses can be used to develop models that can be updated as market conditions, worker tasks, and exposures evolve. As advanced protective strategies (including technologies, standards, and guidelines) are implemented, our models will show the reduction in worker risk and exposure. Demonstration studies provide a hard measure or link between the models and actual workplace reductions in injury. Modeling strategies will provide a timely measure of programmatic success because of the large time gap often associated with worker exposure and worker illness. Through partnerships with NPPTL's user communities, these intermediate outcomes directly lead to public benefit outcomes—i.e., reduction of work-related injury and illness, and reduction in economic, human, and lost opportunity costs.

# Strategic Planning

Integration of Essential Management Components

Baldrige National Criteria	GPRA	PMA	FAIR Act	OMB A-76	PART	Local Negotiated Agreement
Business Results	✓	✓			✓	
Leadership	✓	✓	✓	✓		
Strategic Planning	✓	✓	✓	✓	✓	✓
Customer/Market Focus	✓	✓			✓	
Information & Analysis	✓	✓			✓	
Human Resource Focus		✓	✓	✓		✓
Process Management	✓	✓	✓	✓		✓

GPRA – Government Performance and Results Act (1993) (Focus on performance)  
PMA – President's Management Agenda (Achieves results that matter)  
FAIR – Federal Activities Inventory Reform Act (Assessing susceptibility to competition)  
OMB – Office of Management and Budget Circular A-76 (Federal policy for public-private competition)  
PART – Program Assessment Rating Tool (Program improvement)



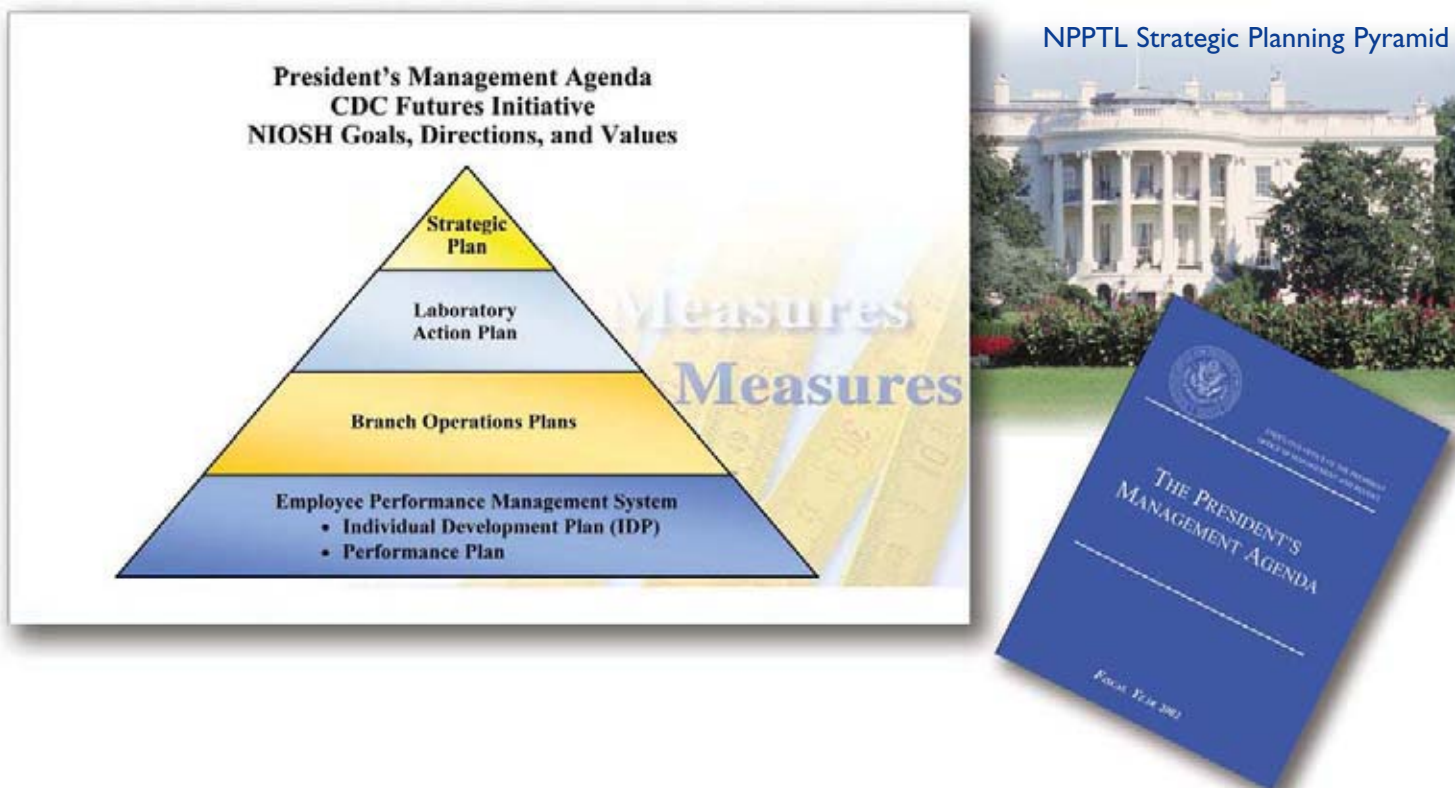
## Baldrige Criteria

NPPTL decided that the fundamental framework for the Laboratory would be the criteria defined by the Baldrige National Quality Program.\* The seven criteria of the Baldrige Program have been used over the last 15 years by thousands of U.S. organizations to improve performance and to stay abreast of ever-increasing competition. The program permits an organization to assess performance on a wide range of key results indicators: customer, product and service, financial, human resources, and operational. NPPTL management also realized that various governmental reporting and management requirements had to be considered so the resulting strategic plan would be responsive to government as well as stakeholder needs. The chart on integration of essential management components indicates how the comprehensive Baldrige criteria incorporate all these requirements. Included in this list is the negotiated agreement with American Federation of Government Employees Local 1916, which is the elected, exclusive representative of NPPTL bargaining unit employees.

Using the Baldrige criteria as a framework acts as a check throughout our planning effort to ensure that key aspects of the criteria for excellence are accounted for. We are on the right track, as shown in the representative examples below.

- The local union Vice President and management's Collective Bargaining Official are members of the Strategic Planning Executive Steering Committee.
- Activities with academia and other Federal agencies accounted for a significant portion of our FY 2003 budget.
- Prudent attention is given to hiring only federal employees for inherently governmental activities.
- E-government improvements include a stakeholder-friendly website and systematic stakeholder involvement through website updates on CBRN respirator standards development.
- Private sector contracting is an increasing part of our program.
- All NPPTL managers are on performance-based contracts. NPPTL also recently completed a pilot Individual Development Plan (IDP) program that will be available to all NIOSH employees.

\* The Baldrige Criteria reflect validated, leading-edge management practices against which an organization can measure itself, and are accepted nationally and internationally as the business model for performance excellence. ([www.baldrige.org](http://www.baldrige.org))



## Strategic Planning Structure

Policy and performance directions from CDC, including its Futures Initiative, and the NIOSH Strategic Plan are fundamental drivers for NPPTL planning. This activity will produce a series of interlinked and aligned documents:

**Strategic Plan:** This document gives management, employees, and stakeholders a broad overview of the Laboratory's mission, its strategic objectives, and key activities. It covers a nominal 5-year period and is distributed to all key stakeholders. It is updated annually through an assessment of the complete personal protective technology environment and with benchmarking studies.

**Laboratory Action Plan:** This plan is a strategy deployment document that provides a detailed roadmap of how the Laboratory will systematically address and measure its progress in achieving its strategic objectives and key activities. It covers a nominal 3-year period and is primarily an internal management plan that is updated annually.

**Branch Operations Plans:** These are also deployment documents and are prepared by all branches to detail the specific shorter-termed actions (i.e., projects) that must be taken to advance the Laboratory's programs and related activities.

**Employee Performance Management System:** These documents are the agreements between each NPPTL employee and their supervisor on how the employee will contribute to branch activities in accomplishing the Laboratory's strategic objectives. These plans identify specific individual performance objectives with due dates for completion.

*Photo credit: The White House by Ken Hammond,  
U.S. Department of Agriculture*

## Annual Assessment Activities

- Conduct environmental assessment
- Organizational assessment
- Update strategic plan
- Update laboratory action plan
- Perform benchmarking
- Employee performance plans and appraisals
- Employee skills inventory



Assessment Activities for Sustaining Organizational and Research Excellence



## Annual Assessment Activities

A series of annual data collection activities will be performed. The results of these activities, and those from the periodic performance reviews conducted throughout the year, will be used to ensure that (1) the strategic and laboratory action plans are current; and (2) NPPTL remains on the best path to meet the protective technology product and service needs of its stakeholders consistent with available human, financial, physical, and informational resources. These activities include the following.

- A detailed environmental assessment will be conducted to provide intelligence on what is and what may be happening, both inside and outside NPPTL. Key components of this assessment will include a review of legal and regulatory factors affecting NPPTL, protective equipment manufacturers, and other stakeholders; trends in the PPE industry; an analysis of stakeholder groups or user communities; an analysis of technological trends and internal technological capabilities; a strengths, weaknesses, opportunities, and threats (SWOT) analysis; reviews of customer, stakeholder, and employee survey feedback; and an internal capabilities analysis (differentiating existing resources from those that need to be acquired or developed).
- A benchmarking strategy will be developed and implemented to determine best research and management practices occurring at selected, highly respected civilian and military Federal, and private-sector laboratories. Evaluation of these practices will be made to determine which are applicable to NPPTL.

The Baldrige Organizational Assessment tool used in May 2003 to establish a baseline of NPPTL operations and culture will be repeated. This assessment will help NPPTL determine which of the seven criteria categories need the most improvement. For NPPTL, the criteria emphasize achieving PPT results in surveillance, research, and advanced protective strategies through the systematic deployment of value creation processes. The Employee Skills Inventory will also be updated.

# Strategic Objectives and Key Activities

The seven strategic objectives identified in this section are essential for NPPTL to systematically address the challenges seen in successfully carrying out its mission. We also align 25 key activities with the appropriate objectives to form a path for meeting these objectives.

## **I: Scientific Research—Develop a quality and responsive research portfolio that fulfills high-priority PPT needs of our stakeholders in the areas of respiratory protection, sensors, human performance, and fully integrated, intelligent ensembles.**

- 1.1 By 2008, provide scientific and data-driven recommendations to improve respiratory protection for a diverse user population; and fill gaps in knowledge, methods, and measures necessary for new NIOSH respirator performance, quality, and reliability standards. A combination of in-house research expertise and partnerships with other research organizations will be used.
- 1.2 By 2008, in collaboration with stakeholders, develop and evaluate prototype fully integrated, intelligent ensembles to reduce the health hazards of fire fighters in conventional and non-conventional operating environments. The reduction in health hazards through the use of ensemble performance, quality, and reliability standards and technologies that are transferred to the private sector will be validated through risk assessment models, demonstration projects, and surveillance studies.
- 1.3 By 2008, develop and conduct hypothesis-driven laboratory studies designed to measure human physiological, biomechanical, cognitive, and exercise performance responses to wearing PPE ensembles. These human impact studies will provide data to be used in the assessment of emerging technologies; the development of performance, quality, and reliability standards; and the creation of specialized training and physical fitness programs.
- 1.4 By 2008, develop, evaluate, and integrate effective residual service-life indicators, other sensors, and predictive models for protective clothing and respirators into PPE ensembles.



*Photo credit: (at bottom) U.S. Air Force Senior Airman Matthew Bates*

**2: *Advanced Protective Strategies*—Develop and support the implementation of quality programs and procedures for establishing and evaluating technologies, standards, and guidance documents for PPE equipment and fully integrated, intelligent PPE ensembles.**

- 2.1 By 2006, provide the leadership to ensure the integrity of the national inventory of respirators for emergency responders and other worker groups.
- 2.2 By 2008, develop and implement a just-in-time respirator certification process that utilizes private sector resources.
- 2.3 By 2008, enable certification of fully integrated, intelligent PPE ensembles by developing standards, identifying appropriate approval processes, and issuing guidance documents.
- 2.4 By 2008, enhance worker safety and health by developing and implementing a process that enables the seamless introduction of new technologies into the NIOSH certification of respiratory protection products.
- 2.5 By 2008, enable NPPTL and its operations to be certified against the requirements of appropriate internationally recognized standards, such as those of the American National Standards Institute (ANSI) and the International Organization of Standardization (ISO).
- 2.6 By 2009, provide the leadership to establish an internationally accepted set of respirator standards by aggressively supporting NPPTL employee membership and participation in key standards development organizations.

**3: *Partnerships*—Become recognized by stakeholders and other Federal Government organizations (including the U.S. Department of Homeland Security, the National Aeronautics and Space Administration, and the U.S. Department of Defense) as the leader and preferred partner to develop advances in worker PPE ensembles.**

- 3.1 By 2004, develop a management plan to formalize relationships and methods of communication to maximize the productive use of funding, maintain existing strong partnerships, strengthen other partnerships that can be improved, and establish new partnerships needed for mission accomplishment.
- 3.2 By 2004, implement the plan to strengthen relationships with existing partners, including other NIOSH divisions and laboratories, other institutes within CDC, the mining community, and academic institutions.
- 3.3 During 2005, implement the plan to maintain strong and effective partnerships with the emergency response community.
- 3.4 By 2006, implement the plan to establish effective partnerships with the healthcare community, U.S. Department of Homeland Security (DHS), U.S. Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration (MSHA), other national laboratories, and state emergency response organizations.



#### **4: Management Systems and Workforce—**

**Using an integrated and systematic management approach, organize a Federal and non-Federal workforce into a national laboratory capable of balancing the requirements of achieving strategic objectives and producing planned outputs and outcomes, while providing expeditious response to worker protection needs and technological advancements.**

- 4.1 By 2004, implement an NPPTL-wide management system (including a Performance Measurement System) that addresses the requirements of the President's Management Agenda and other Federal directives, and incorporates the Baldrige Criteria for Performance Excellence.
- 4.2 During 2004, develop and initiate benchmarking and environmental assessment studies to obtain the data and information needed to keep strategies current and focused.
- 4.3 By 2005, implement a personnel management and work environment plan to develop and use the fullest potential of all employees, and create procedures for the annual allocation of Federal and non-Federal human resources to address programmatic and operational requirements.
- 4.4 By 2006, implement a financial management system, including an annual procurement plan for discretionary funding of external research, to ensure suitable and timely utilization of designated and other received funds.



#### **5: Facilities—Use appropriate in-house and partner state-of-the-art facilities and equipment needed to excel in the research on and certification of PPE and PPE ensembles.**

- 5.1 By 2005, initiate implementation of a comprehensive plan to use world-class facilities and operations with key partners in support of NPPTL's programs.

*Photo credit: The Supreme Court by Ken Hammond, U.S. Department of Agriculture*

**6: Information Management**—Implement an NPPTL information management system that provides needed data and information for external and internal use, including updates and progress on achieving measures and schedules for deliverables.

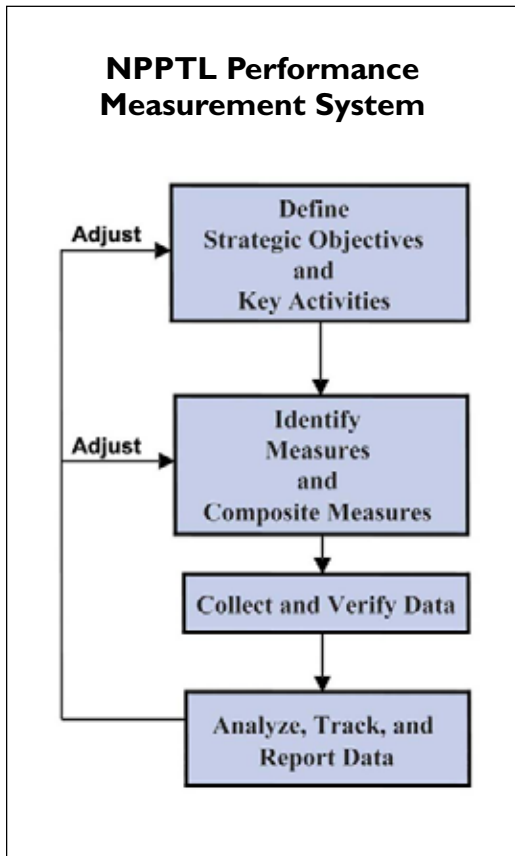
- 6.1 By 2006, develop an information module that automatically produces periodic reports for the NPPTL Performance Measurement System, including updates and progress on achieving measures and schedules for deliverables.
- 6.2 By 2006, develop an information module for the management and continuous improvement of key processes involved with research planning, execution, and completion; and intervention activities, including certifications, such as the Firefighter Fatality Database and the Certified Product Investigation Process (CPIP).
- 6.3 By 2008, develop an integrated and interactive Information Management System for the collection, storage, maintenance, and easy retrieval of programmatic and operational data, with public-sector access to appropriate data through various e-government initiatives.

**7: Communications**—Develop an integrated communication system that ensures that internal and external stakeholders and partners are fully aware of the activities and successes of NPPTL.

- 7.1 During 2004, integrate NPPTL internal functions into a seamless operation to facilitate internal communications, thus improving employee awareness and organization productivity.
- 7.2 By 2005, establish communication channels (including electronic means through e-government initiatives) with all partners and stakeholder groups to ensure timely and effective response to their needs and rapid dissemination of NPPTL results.
- 7.3 By 2006, establish a continuous quality improvement communication training and evaluation system to serve the needs of NPPTL staff and partners.



# Performance Measurement System



## NPPTL Scientific Research Measures

### Measures for Scientific Research Outputs

- Number of NPPTL first author peer-reviewed publications per full-time equivalent (person) per year
- Number of peer-reviewed scientific publications from NPPTL employees and contractors
- Number of citations of NPPTL research in the literature
- External funding received for on-site research
- Percentage and number of research projects in which agreed-upon objectives were met successfully (schedule and budget)
- Number of external and internal research collaborations
- Number of invited presentations at technical conferences
- Number of patents (3-year average)
- Number of cooperative research and development agreements (CRADAs)

### Measures for Scientific Research Intermediate Outcomes

- Number of standards impacted
- Number of manufactured products that used NPPTL research data to improve equipment performance
- Number of licensed patents

### Measure for Scientific Research Public-Benefit Outcomes

- Reductions in work-related injury and illness relevant to PPE use

Highly successful organizations result from a willingness and ability to aggressively measure performance, and then communicate the results both internally and externally. NPPTL recognizes this fact and is developing and implementing its own Performance Measurement System. A key part of this system is the linkage and alignment between the identified measures and NPPTL's strategic objectives.

The system is designed to identify the most appropriate measures to describe our organizational directions, our performance, and our accomplishments. The intent is to allow managers and employees to improve NPPTL's outputs and outcomes for the use and benefit of its customers and stakeholders. This clearly demonstrates which NPPTL activities are key to defining success and how this success is to be measured.

The data necessary to calculate each measure are periodically collected and verified. Verification ensures that subsequent analyses and decision-making are based on the most accurate and recent data.

These data are then analyzed, tracked, and reported. The analyses translate the collected data into information and intelligence for use by all decision-making employees and managers. The system yields timely and relevant input to them in a concise format.

The system is iterative for measures and measurement processes themselves, and also through time for the strategic focus and objectives NPPTL is pursuing. This feedback and adjustment loop is present in all NPPTL operating systems.

### NPPTL Performance Measurement System

Key Activities	Outputs (Products and Services)	Measures	Global Categories	Composite Measures (For Global Categories)	Intermediate Outcomes (Products and Services Uses)	Customers	Measures	Global Categories	Composite Measures (For Global Categories)	Public Benefit Outcomes	Measures
1.1											
7.2											

### NPPTL Measures for Advanced Protective Strategies

**Measures for Advanced Protective Strategies Outputs**

- Time until first approval application is received subsequent to new standards
- Number of prompt submittals received after new standards are implemented
- Number of approvals issued
- Time to approve submittals
- Acceptable performance to monitoring activities
- Number of new guideline documents
- Number of requests for guideline documents

**Measures for Advanced Protective Strategies Intermediate Outcomes**

- Number of OSHA enforcement policy changes
- Number of surveillance activities to measure model availability and use of product
- Citation of standards developed by NPPTL
- Reductions in exposures to work-related hazards

**Measure for Advanced Protective Strategies Public-Benefit Outcomes**

- Reductions in work-related injury and illness relevant to PPE use

The NPPTL Lead Team is systematically analyzing each of 25 identified key activities to define appropriate measures. Measures are needed to monitor progress in producing outputs, intermediate outcomes, and public benefit outcomes.

Two public benefit outcomes cover all NPPTL activities:

1. Reductions in the incidence of work-related injury and illness relevant to PPE use; and
2. Reductions in economic, human, and lost opportunity costs from work-related injury and illness.

The difficulty of quantifying the impact of NPPTL’s outputs on any of these public benefit outcomes (which are themselves difficult to measure) was immediately recognized. This led to the development of the concept of intermediate outcomes, the string or series of benefits that flow from the use of NPPTL outputs by our stakeholders. At one end of the string are NPPTL outputs, and public benefit outcomes are at the other end.

As an example, one planned output from NPPTL’s scientific research key strategic objective includes new sensor technologies to monitor the physiological impact of using fully integrated PPE ensembles. The various stages of the technology development and commercialization process that NPPTL’s technology developers and suppliers will follow as they incorporate NPPTL-developed technologies into advanced ensembles are all intermediate outcomes. Many of these can be more readily measured, and thus lead to nearer-term and more precise evaluations of the effectiveness (and efficiency) of NPPTL programmatic activities.

This methodology also incorporates collecting similar-in-type NPPTL outputs and intermediate outcomes into global categories, such as leadership, credibility, quality, and integrity. These categories cut across the seven strategic objectives. Progress in the global categories can then be monitored through the definition and monitoring of composite measures.



## The Path Forward

We at NPPTL have sought, received, and incorporated into this Strategic Plan information and suggestions from numerous internal and external sources with different perspectives. We believe this diverse input has helped us define the appropriate direction for the delivery of safer workplaces and our role in reducing harmful exposures, injuries, and adverse health effects for workers everywhere.

We will accomplish our mission by focusing our efforts towards meeting our strategic objectives and the various key activities that support them. We have designed NPPTL management systems to direct and monitor these efforts.

The key to successful implementation of any strategic plan is to use the identified goals and objectives to drive the work of the organization, while remaining adaptable enough to be responsive to immediate (and in many cases) unforeseeable events. NIOSH staff at the National Personal Protective Technology Laboratory have dedicated ourselves to successfully implementing our Strategic Plan. We will meet the short-term requirements and long-term needs of U.S. workers for personal protective equipment and technologies. We also will continuously ask our customers and stakeholders how we are doing and what changes we need to make to improve our performance.

*Photo credit: Tidal Basin and Washington Monument in early morning by Ken Hammond, U.S. Department of Agriculture*

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### For More Information

NPPTL Website: [www.cdc.gov/niosh/npptl/](http://www.cdc.gov/niosh/npptl/)

NIOSH Website: [www.cdc.gov/niosh/](http://www.cdc.gov/niosh/)

NIOSH publication 2003-127, July 2003: *National Personal Protective Technology Laboratory*, [www.cdc.gov/niosh/docs/2003-127/2003-127.html](http://www.cdc.gov/niosh/docs/2003-127/2003-127.html)

To obtain additional copies of the NPPTL Strategic Plan, or if you have questions about the National Personal Protective Technology Laboratory, please contact the Office of the Director, NPPTL, at (412) 386-6544.



# NPPTL Partners

## U.S. Government Organizations

- U.S. Department of Commerce
  - National Institute of Standards and Technology
- U.S. Department of Defense
  - U.S. Army Research, Development, and Engineering Command
- U.S. Department of Energy
  - Los Alamos National Laboratory
  - National Energy Technology Laboratory
- U.S. Department of Homeland Security
- U.S. Department of Justice
- U.S. Department of Labor
  - Bureau of Labor Statistics
  - Mine Safety and Health Administration
  - Occupational Safety and Health Administration
- U.S. Department of Veterans Affairs
- InterAgency Board for Equipment Standardization and Interoperability
- National Aeronautics and Space Administration

## Other Organizations

- American Federation of Government Employees
- International Association of Fire Chiefs
- International Association of Firefighters
- International Safety Equipment Association
- National Fire Protection Association
- Organizational Resources Counselors
- RAND's Science and Technology Policy Institute
- United Mine Workers of America

## Academia

- Carnegie Mellon University
- North Carolina State University
- Oak Ridge Institute for Science and Education
- The Pennsylvania State University
- University of California at Berkeley
- University of Cincinnati
- University of Maryland
- University of Minnesota
- Virginia Polytechnic Institute and State University
- West Virginia University



Photo credit: Steps of the United States Capitol, in Washington, DC  
U.S. Army Corps of Engineers



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