

NIST FY 2012 Budget Overview

Working with Industry to Accelerate Innovation

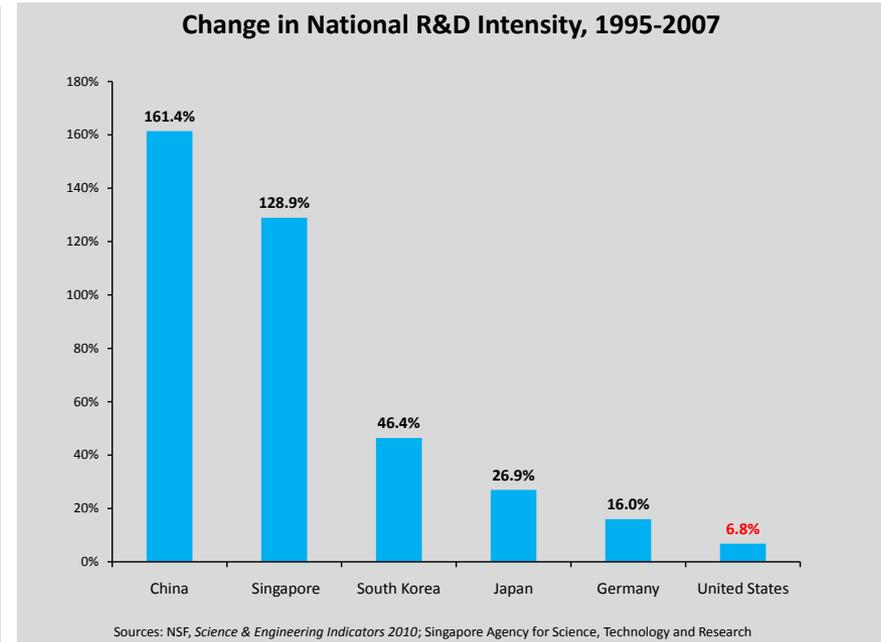
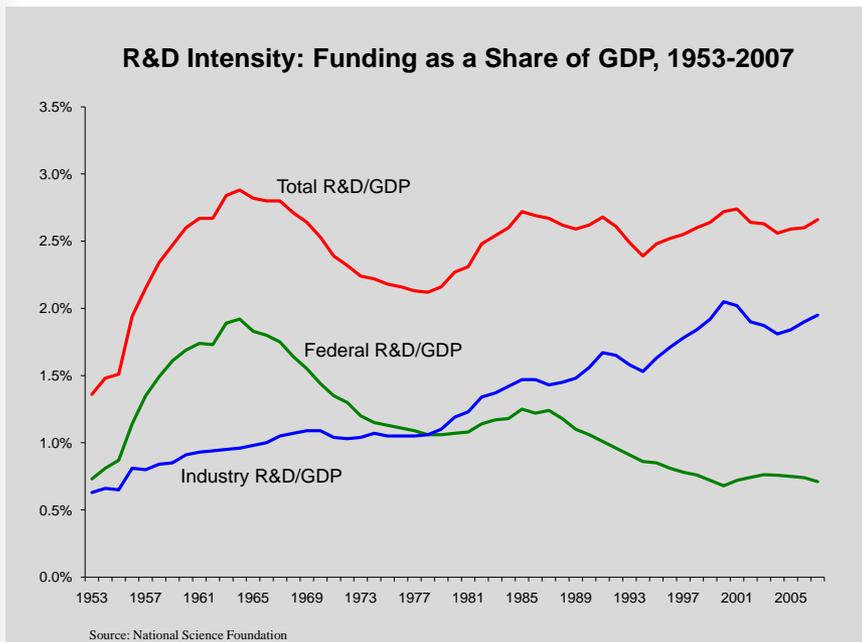
Dr. Patrick Gallagher

Under Secretary of Commerce for Standards and Technology

Losing our Competitive Edge

“..We’re losing our edge....Until now, we’ve been the undisputed leaders when it comes to finding new ideas through basic research, translating those ideas into products through world-class engineering..”

Norm Augustine in “Danger: America is Losing Its Edge in Innovation”



“If we don’t explore, others will, and we’ll fall behind.”

Ronald Reagan, Radio Address to the Nation on the Federal Role in Scientific Research April 2, 1988

NIST – Targeting Investments to Advance U.S. Innovation and Boost Economic Recovery

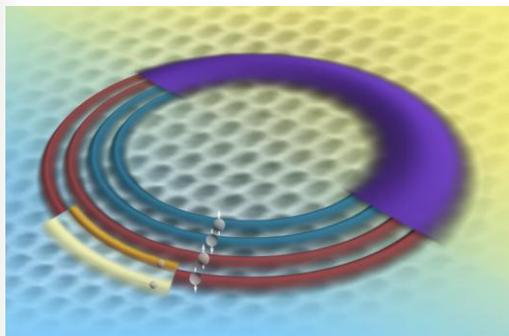
NIST Mission

To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

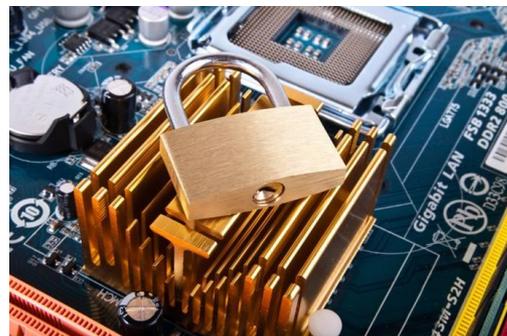
- Deep research expertise underpins technological innovation – e.g. lasers, memory, GPS, wireless
- Non-regulatory status enables important role as a convener that facilitates collaboration between industry and government

FY12 Request Addresses Challenges in Key Priority Areas

- Manufacturing
- Information Technology and Cybersecurity
- Healthcare
- Environment and Consumer Safety
- Energy
- Physical Infrastructure



Nanomanufacturing: New measurement tools for advanced materials manufacturing



Cybersecurity: Improved response to cyber threats



Energy: Measurements and standards for energy security

NIST FY 2012 Budget Request Compared to FY 2010 Enacted (Dollars in millions)

	FY 2010 Enacted	FY 2011 Annual CR	FY 2012 Request	+ / (-) Over FY10 Enacted
STRS	\$ 515.0	\$ 505.4	\$ 678.9	\$ 163.9
Laboratory Programs	460.6	460.6	630.2	169.6
Baldrige Perf. Excellence Prg. ^{1/}	9.6	0.0	0.0	(9.6)
Corporate Services	18.9	18.9	19.5	0.6
Congressional Projects	10.5	10.5	0.0	(10.5)
Stds Coord. and Spec. Prgs.	15.4	15.4	29.2	13.8
ITS	\$ 194.6	\$ 204.2	\$ 237.6	\$ 43.0
Advanced Manu. Tech. Consort.	0.0	0.0	12.3	12.3
Technology Innovation Prg.	69.9	69.9	75.0	5.1
Baldrige Perf. Excellence Prg. ^{1/}	0.0	9.6	7.7	7.7
Hollings Manuf. Ext. Prg.	124.7	124.7	142.6	17.9
CRF	\$ 147.0	\$ 147.0	\$ 84.6	\$ (62.4)
Const. & Major Renovations	22.0	22.0	25.4	3.4
Saf. Cap., Maint., Maj. Repairs	58.0	58.0	59.2	1.2
Competitive Const. Grant Prg.	20.0	20.0	0.0	(20.0)
Congressional Projects	47.0	47.0	0.0	(47.0)
PSIF	\$ -	\$ -	\$ 100.0	\$ 100.0
Public Safety Innovation Fund	0.0	0.0	100.0	100.0
Total NIST	\$ 856.6	\$ 856.6	\$1,101.1	\$ 244.5

^{1/} Consistent with the NIST reorganization, the Baldrige Performance Excellence Program moved from STRS to ITS effective FY 2011.

NIST FY2012 Scientific and Technical Research Services Program Changes (+\$178.4M)

1. Tools for Manufacturing Competitiveness
 - Strengthening Measurement Science and Standards in Support of Industry Needs (+\$20M)
 - Advanced Materials for Industry (+\$14.2M)
 - Innovations for 21st Century U.S. Manufacturing: Faster, Smarter and Cleaner (+\$13.3M)
 - Measurement Services and Standards to Support Biomanufacturing (+\$9.5M)
 - Measurements to Support the Manufacture and Production of Nanotechnology-based Products (+\$28.3M)
2. Ensure a Secure and Robust Cyber Infrastructure (+\$43.4M)
3. Interoperability Standards for Emerging Technologies (+\$22.8M)
4. Measurements and Standards to Support Increased Energy Efficiency and Reduced Environmental Impact (+\$13.3M)
5. Measurements to Support Advanced Infrastructure Delivery and Resilience (+\$10.6M)
6. Postdoctoral Research Associateships Program (+\$3.0M)



Photo by Kathie Koenig Simon



Courtesy: Inhabitat.com



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NIST and Manufacturing : Building Prosperity through Innovation (+\$120.5 million)

This set of initiatives will catalyze innovations, develop measurements, and provide technical resources to promote the global competitiveness of U.S. manufacturers and aspiring start-ups.

America's future prosperity depends on our nation's innovation performance

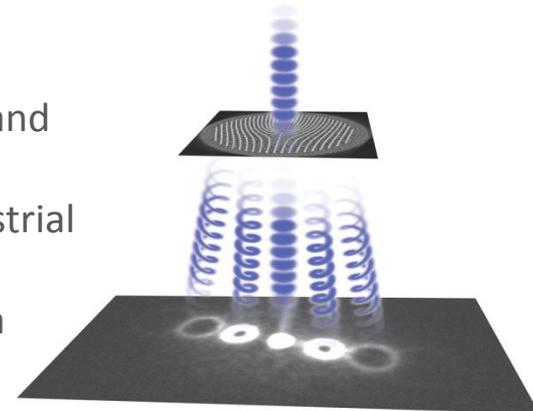
- U.S. manufacturing is worth about \$1.6 T (11% of the GDP)
- High-value-add manufacturing provides the best strategy for maximized return on investment
- China leads U.S. in high-technology exports and the percentage of value added manufacturing is increasing



Courtesy: Heritage Global Partners

NIST will bolster and diversify needed research efforts and services that promote U.S. manufacturing

- Measurements and standards supporting nanomanufacturing, Biomanufacturing, Additive Manufacturing, Sustainable Manufacturing, and Robotics (+\$71.1M)
- Developing the Data Infrastructure enabling Advanced Materials for Industrial Applications (+\$14.2M)
- Establishing the Advanced Manufacturing Technology (AMTech) Consortia (+\$12.3M)
- Supporting the Manufacturing Extension Partnership (+\$17.6M) and Technology Innovation Program (+5.2M)



Credit: NIST

Ensuring a Secure and Robust Cyber Infrastructure (+\$43.4M)

This initiative will increase the Nation's cyberspace security, reduce identity theft, and improve responsiveness to cyber threats.

U.S. critical infrastructure relies on secure cyberspace

- Essential every day activity (e.g., traffic control, electric power distribution, ATM transactions)
- Protection of eCommerce growth (retail eSales grew 21% between 2002 and 2008)
- Consumer protection (identity theft increased 22.3% from 2008 to 2009)

NIST will protect U.S. complex cyber infrastructure from escalating threats

- National Program Office for the National Strategy for Trusted Identities in Cyberspace (NSTIC) (+\$24.5M)
- Scalable Cybersecurity for Emerging Technologies and Threats (+\$14.9M)
 - Improve cryptographic capabilities, security management automation, security metrics for large-scale systems, usability
- National Initiative for Cybersecurity Education (NICE) (+\$4.0M)



Courtesy: www.gizmodo.com

Interoperability Standards for Emerging Technologies (+\$22.8M)

This initiative addresses the need for the development of interoperability standards for Smart Grid, Healthcare IT/Electronic Health Records, and Cloud Computing.

The need for these standards has been mandated by legislation and are essential to guide government utilization of these productivity enhancing technologies.



Courtesy: techbuzz.com/GM Autos

Lack of standards stifle technology development and discourages innovation and competition:

- Half of U.S. power producing coal plants over 40 years old use antiquated systems - upgrade and replacement will cost \$560 B by 2030
- Estimated \$150 B market for cloud services in 2013 with little or no interoperability
- Only 13% of doctors use EHRs and 1.5% of hospitals have comprehensive electronic records system - huge potential for cost saving, reduced medical errors

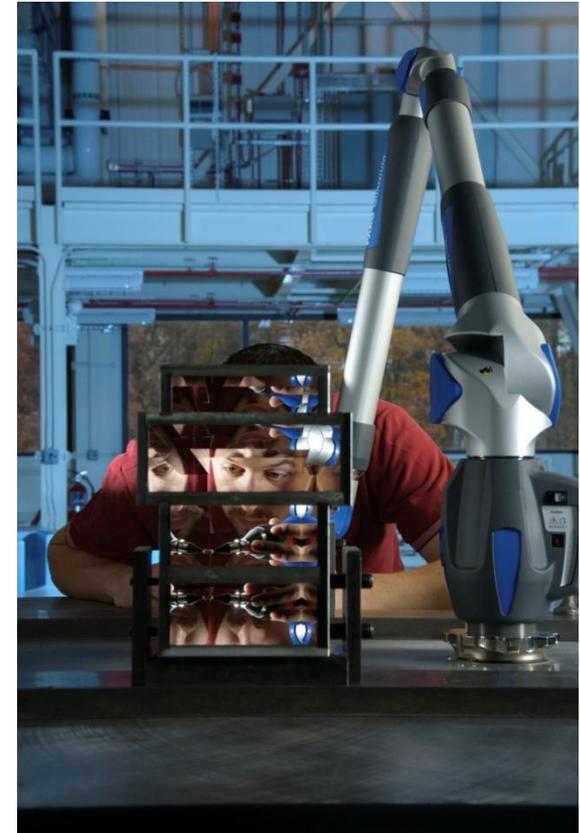
NIST will coordinate the development of interoperability standards and conformity assessment requirements through public-private sector partnerships:

- Identify standards needs – in Smart Grid the needs are driven by over 3000 utilities, hundreds of vendors and 27 different Standards Organizations
- Accelerate standards development processes – reduce time from 2-3 years to 6-9 months
- Develop demand driven conformity assessment requirements – ensure interoperability of the products of over 300 Health IT vendors and thousands of potential Smart Grid vendors.

NIST FY12 Industrial Technology Services Request (+\$33.0M)

Targeted Investments to Drive Continued Innovation in Manufacturing and Industry

- Manufacturing Extension Partnership -- \$142.6M (+\$17.6M)
 - Expand delivery of services targeting technology innovation and commercialization; environmentally sustainable business practices; renewable energy initiatives; market diversification; supplier development; and export opportunities for domestic manufacturers.
- Technology Innovation Program -- \$75.0M (+ \$5.2M)
 - Supporting high-risk R&D to address critical national needs
- Advanced Manufacturing Technology Consortia – \$12.3M (+\$12.3M)
 - Collapsing the timescale of technological innovation through industry-led consortium based R&D
- Baldrige Performance Excellence Program -- \$7.7M(-\$2.1M)
 - Identify alternative funding options, generate efficiencies, and reduce program overhead



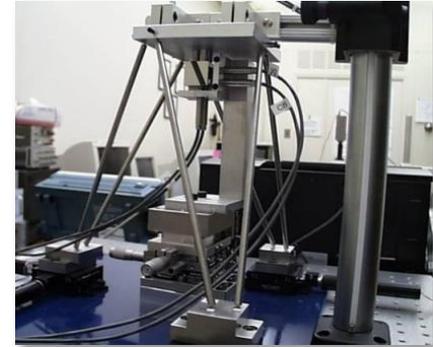
Hollings Manufacturing Extension Partnership (MEP) Program (+\$17.6M)

This Initiative will spark the innovative capacity of US manufacturers.

MEP provides US manufacturers support to navigate ever-increasing challenges from global competition, the ability to continually innovate, and increase their contribution to the economic recovery.

Through competitively awarded grants NIST MEP will expand the capabilities of its nation wide network of centers to encourage:

- More commercialization of technological innovations
- Environmentally sustainable business practices
- Renewable energy initiatives
- Market diversification
- Supplier development
- Export opportunities for domestic manufacturers



NIST-patented 3D Nanopositioner to be used by Process Equipment Company (PECo) in Dayton, OH



Istock photo

Advanced Manufacturing Technology Consortia (AMTech) (+\$12.3 M)

This initiative will support R&D in advanced manufacturing and strengthen long term US leadership in critical technologies leading to sustainable economic growth and job creation.

U.S. R&D intensity lags behind competing nations

- Inadequate transition of critical new technologies from laboratory to domestic marketplace
- Investment is needed to increase efficiency of current high-tech industry

NIST will

- Foster and promote industry consortia to tackle common technological barriers to the innovation and manufacturing of new products.
- Through grants and a common research agenda support the development of innovative new technologies aligned with industry needs
- Compress the timescale of technological innovation



NIST FY2012 Construction of Research Facilities Requests (\$84.6 M)

These funds will enable renovation and construction of research facilities to strengthen NIST's core facilities to secure U.S. leadership in measurement science.

Boulder Building 1 Renovation (+\$25.4 M)

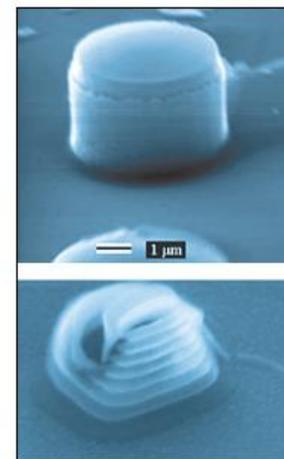
- Renovation of existing buildings and construction of new high quality laboratory space for state-of-art facilities
- Multi-year project initiated in FY 2010
- Improves safety of existing facilities
- Reduces operational costs (more efficient environmental controls and less down-time due to repair)

Safety, Capacity, Maintenance and Major Repairs (SCMMR) (\$59.2M)

- continue the repair and upgrade of facilities that have a high impact on staff and visitor safety,
- continue abatement of hazardous materials from site buildings and structures,
- enable or maintain building environmental conditions required for meeting scientific requirements.



Credit: NIST



NIST and the Wireless Innovation Fund -- (\$500M in mandatory funding)

Public Safety Innovation Fund (\$100M/yr for 5 years)

This program (component of Wireless Innovation Fund) supports the Wireless Innovation Infrastructure Initiative and will address critical barriers to innovation, increase efficiency of domestic innovation, and accelerate delivery of new products and services for public safety communication technologies.

Public Safety Communication critical to U.S.

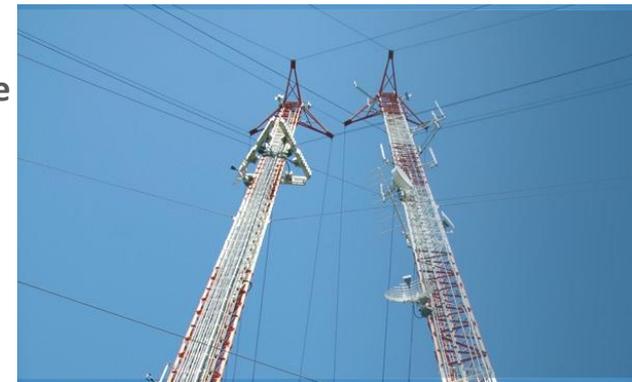
- 4 million first responders impacted by an end-to-end interoperable wireless network
- Unique public safety requirements and considerations – cover 95% of US population, minimum 90% system availability, etc.
- Enable data and video flows augmenting voice communication

NIST will work with industry and public safety organizations to:

- Conduct research and develop new technologies and applications to advance public safety communications
- Create 700 MHz Public Safety Broadband Demonstration Network
- Coordinate standards development and conformance testing
 - identify and incorporate public-safety requirements into national and international standards



Courtesy: Integerwireless.com



Courtesy: Summit Towers

Additional Program Descriptions

Strengthening Measurement Services in Support of Industry Needs (+\$20.0M)

This initiative will result in foundational research and development improvements that will advance technology sectors such as telecommunications, aerospace and power distribution systems.

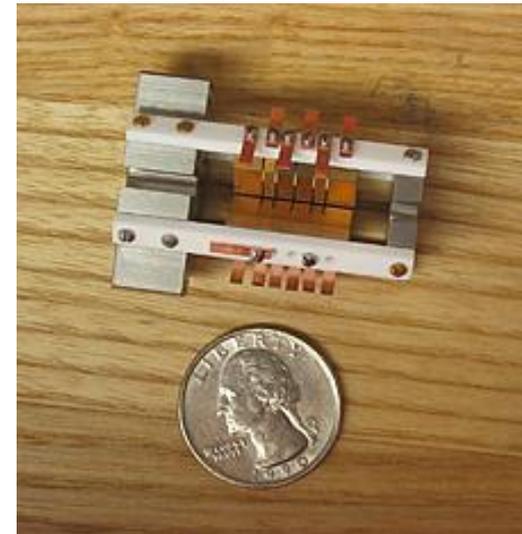
The U.S. economy depends on a robust and reliable physical science-based measurement system.

- Telecom networks represent about \$400 B of annual economic activity
- NIST provides calibrations for commercial and federal government partners such as those of altimeters and electrical systems in aircrafts that enable F-18s and commercial aircraft to fly.
- NIST supports over 70000 calibrations relating to nuclear detectors, keeping the nuclear stockpile ready, and providing nonproliferation tools.

Without increased funds NIST will not be able to keep pace with industry's needs

NIST will

- Maintain effective delivery of current critical measurement services
- Develop new measurement services and technologies to support growth in high-technology industries and emerging technology sectors



Advanced Materials For Industry (+\$14.2M)

This initiative will enable widespread adoption of advanced modeling; accelerating the development of “smarter”, lighter, stronger and more sustainable materials.

The discovery and optimization of new materials is costly and inefficient

- Manufacturers that use validated models and software save millions of dollars in design costs.
 - Ford: Virtual Aluminum Casting method saved \$100 million over traditional methods. Overall ROI exceeding 7:1
 - DOE ORNL: Now using computational methods to direct alloy development for Gen 4 nuclear reactors.
 - GE: Development time for jet engine alloys reduced from 15 to 9 years, with targets for 5 years.

NIST will enable advanced materials by developing:

- Computational and validated databases, data assessment tools, techniques and standards.
- Reference models and simulations
- Mechanisms for exchange of information and best practices



Copyright: J. Antonius



Courtesy: U.S. ARMY

Innovations for 21st Century U.S. Manufacturing: Faster, Smarter and Cleaner (+\$13.3M)

This initiative will provide a U.S. manufacturing infrastructure that is timely, more intelligent, and more environmentally sustainable.

U.S. Manufacturing must continue to innovate in order increase productivity and efficiency to remain competitive in high-value add manufacturing:

- Industry is moving toward the adoption of potentially disruptive technologies enabling rapid prototyping and mass-customization
- Advances in robotics are enabling more pervasive and interactive robot platforms that will require new safety standards
- Industry is seeking tools to optimize processes and increase sustainability

NIST will

- Benchmark and lower the risk to the adoption of additive manufacturing technologies
- Provides safety standards and performance testing necessary for advanced robotics platforms
- Develop metrics and measurement tools to bench mark sustainability and allow the adoption of best practices across industry



Measurement Science and Standards to Support Biomanufacturing (+\$9.5M)

This initiative will reduce manufacturing costs, increase production efficiency, and improve the quality of biologic products (e.g. pharmaceuticals).

Biotechnology medicines are critical for the U.S. healthcare system

- Fastest growing pharmaceutical class (~20% of health care spending)
- Poorly understood manufacturing process (~\$15B/yr on inefficiencies)
- Regulatory challenge in determining performance of similar products without repeated costly clinical trials

NIST will develop measurements for biomanufacturing

- Improved real-time monitoring and control of biomanufacturing lines to reduce waste in production
- Better measurements to determine safety and efficacy of biopharmaceuticals including characterization of 3-D structure and glycosylation



Courtesy: Univ. of Toledo



Measurements to Support the Manufacture and Production of Nanotechnology- based Products (\$28.3M)

This initiative will position the U.S. to be globally competitive in emerging technologies, such as third-generation photovoltaic devices, through safe use of nanotechnology.

Barriers remain for full commercial exploitation of nanotechnology

- Lack of manufacturing and characterization tools lead to significant delay and high cost of product development
- Lack of measurement s to characterize the environmental, health, and safety risks of engineered nanomaterials
- Limited access to world-class nanotechnology fabrication facilities

NIST will

- Develop technologies to measure the properties and performance of nanomaterial based systems
- Characterize manufactured nanomaterials to enable accurate assessment of health and environmental risks
- Reduce barriers to access to state-of-the-art nanotechnology tools and equipment for industrial and research applications



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Measurements and Standards to Support Increased Energy Efficiency and Reduced Environmental Impact (+\$13.3M)

This initiative will result in more energy efficient and sustainable buildings and building materials through revised building codes and energy performance standards and improved greenhouse gas emission measurement.

U.S. building sector is one the largest consumers of energy:

- 40% of total energy consumed in the U.S.
- Produces 39% of all U.S. carbon dioxide emissions
- Buildings projected to be the top energy consumer by 2025

NIST will:

- Develop measurement tools and standards for performance of energy-efficient building materials
- Develop measurement science to enable accurate measurement of greenhouse gas emissions



Courtesy: Rocky Mountain News

Measurements to Support Advanced Infrastructure Delivery and Resilience (+\$10.6M)

This initiative will mitigate loss of life and property from natural and technical hazards (e.g., earthquakes, fires, hurricanes, aging infrastructure) through improved infrastructure codes, standards, and practices.

Natural and technical hazards are a constant threat to U.S. buildings and infrastructure

- A single major catastrophe (earthquake or hurricane) could potentially cause \$80 B to \$200 B in economic losses

NIST will:

- Develop a National Disaster and Failure Events Database
- Support modeling, code development and best-practice implementation for resilient building techniques
- Develop advanced sensing and service life prediction for infrastructural materials
- Develop information systems, metrics, and tools for measuring and real-time monitoring of construction productivity



I-35 W Bridge Collapse in Minneapolis

Photo Courtesy: Eric Brandt



2007 Greensburg, KS Tornado Damage

Photo Courtesy: thestormreport.com