NIST … Enabling the Future

…Innovation, Trade, Security and Safety

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Science-Engineering-Technology Working Group
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Innovation In The News

"... we live in a competitive world ... We shouldn't take our preeminence as the world's greatest economy for granted. We've constantly got to make sure the economic environment here is strong. We've got to make sure that we're innovative."

President G.W. Bush
April 5, 2004

"Innovation will be the single most important factor in determining America's success through the 21st century."

Report of the "National Innovation Initiative", Council on Competitiveness
December 2004

A National Innovation Policy

- Supporting Innovation through R&D
- Manufacturing
- Measurements and Standards
- Stimulating Private Investment in R&D
- Protecting Intellectual Property

NIST enables the future...

by strengthening the innovation infrastructure to:

- **advance manufacturing and services**
- **facilitate trade**
- **enhance public safety & security**
- **improve quality of life**

...and create jobs

... through measurements, standards and technology...and partnerships

NIST assets and mission

- 3,000 employees
- 1,700 associates
- 1,900 users of facilities
- 1,500 affiliated field agents

- $858 million FY 2005 budget

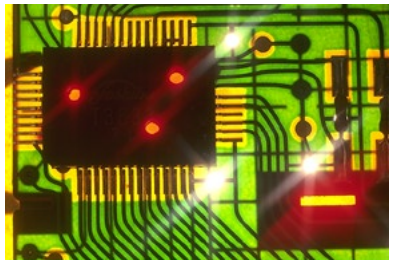
- NIST Laboratories
- Advanced Technology Program
- Manufacturing Extension Partnership
- Baldrige National Quality Program

NIST mission

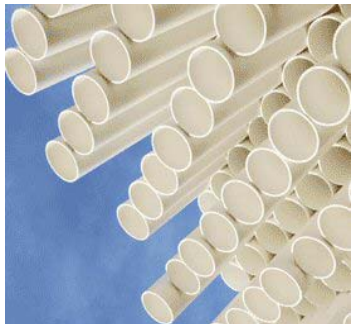
"To develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life."

NIST strengthens the innovation infrastructure to...

...advance manufacturing and services



semiconductor electronics

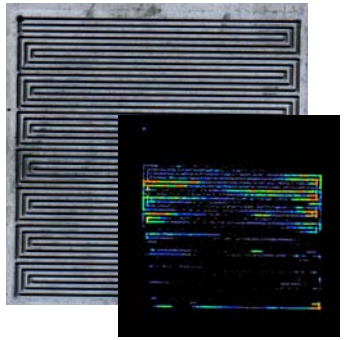


“lean manufacturing” of plastics

automobile manufacturing interoperability

pharmaceuticals

chemicals



fuel cell technology

healthcare

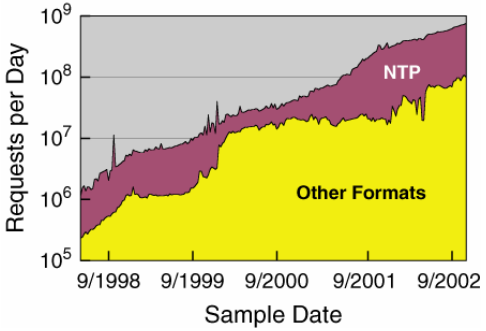
NIST strengthens the innovation infrastructure to...

...facilitate trade

secure automated banking

electric power metering

volume and flow standards



www.time.gov
billions of hits daily

ISO International Organization for Standardization

SIM SISTEMA INTERAMERICANO DE METROLOGIA

international standards to counteract TBTs

CE

EU directive on in vitro diagnostic standards

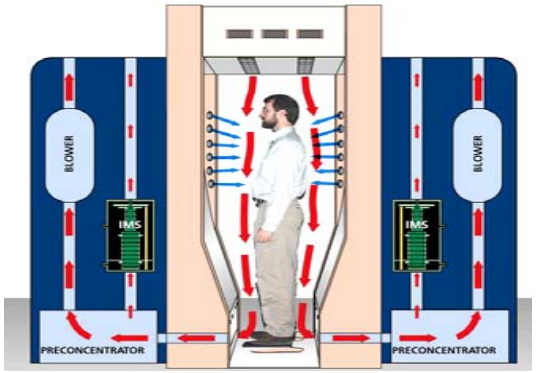
NIST strengthens the innovation infrastructure to…

…improve public safety and security

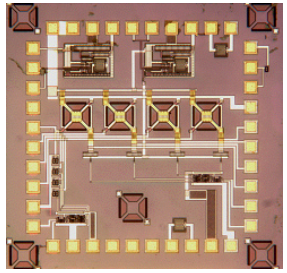
metal detectors

wireless interoperability among first responders

smoke detectors



Trace explosives detection



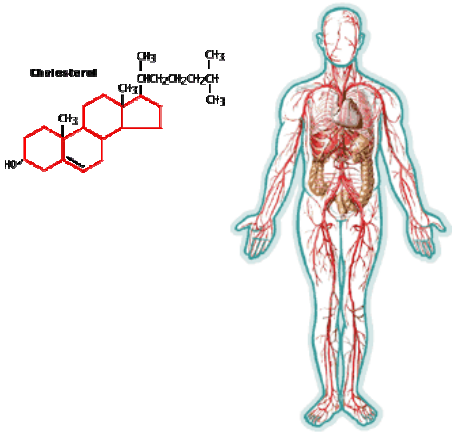
novel sensors to detect gases

altimeter calibration

standards for body armor

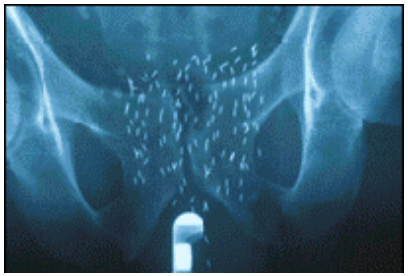
NIST strengthens the innovation infrastructure to...

... improve quality of life

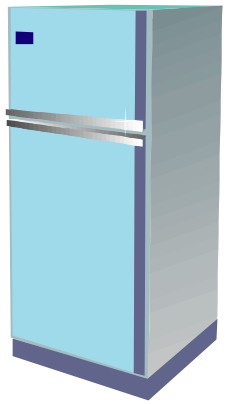


Improved clinical measurements

drinking water quality



prostate and breast-cancer treatment



database and measurements for alternative refrigerants

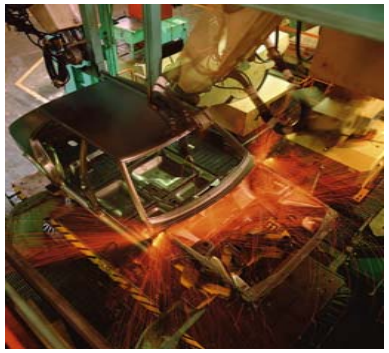
standards for sulfur in fossil fuels

NIST serves a broad customer base…

Environmental Technologies

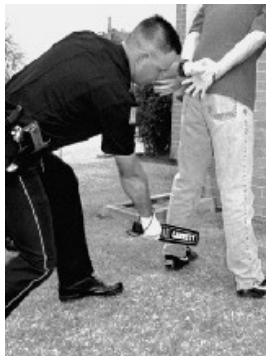
Manufacturing

Food and nutrition



Transportation

Pharmaceuticals



Law enforcement

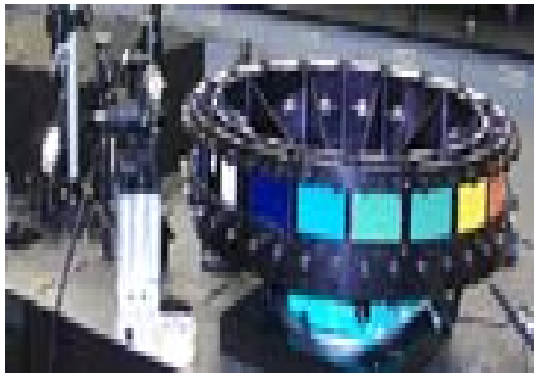
Biotechnology

Computer software and equipment

Construction

Microelectronics

...with many services and products



Calibration Services

NVLAP®

Laboratory Accreditation

Assistance for small manufacturers

Standard reference materials and data

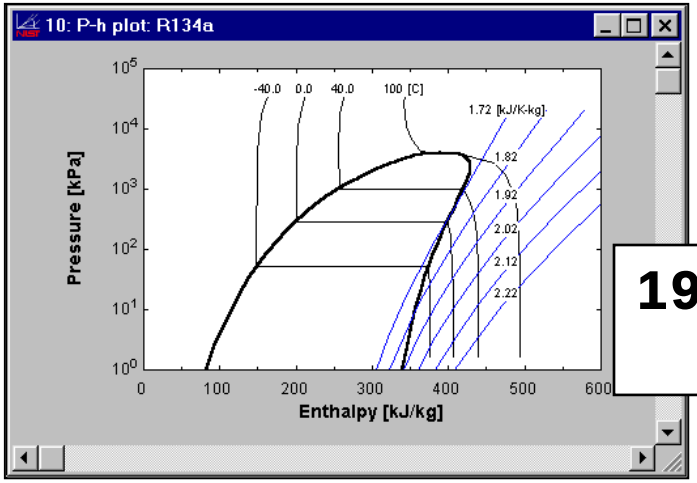
NIST™
Security Configuration
CHECKLISTS
http://checklists.nist.gov
CSD

Cybersecurity Best Practices

Quality Guidelines

Economic Impact of NIST programs

1997 Radiopharmaceutical standards
97:1 benefit-to-cost ratio



1998 Alternative refrigerants
4:1 benefit-to-cost ratio

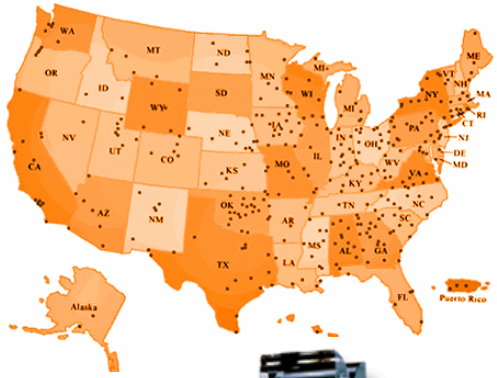
2000 Sulfur in fossil fuels
113:1 benefit-to-cost ratio

Economic Impact of NIST programs (cont'd)

Since inception — **Returns from just 6 % of ATP portfolio:**

- **$17 billion in economic benefits**
- **8 times total ATP investment**

2003 Manufacturing Extension Partnership
$4.1 billion new & retained sales
50,315 jobs created & retained



Since 1988 Baldrige National Quality Program
$25 billion in economic benefits
207:1 benefit-to-cost ratio

NIST has... ...unique research facilities

Advanced Measurement Laboratory (2004)

Advanced Chemical Sciences Laboratory (1999)

NIST Center for Neutron Research

NIST has... ...strong partnerships

Partnerships with industry, academia, and other government agencies have been an integral part of NIST culture since 1901.

ILLINOIS

JILA NIST CU

University of Colorado

CARB

UNIVERSITY OF MARYLAND

Hollings Marine Laboratory

Penn
University of Pennsylvania

AdvaMed
Advanced Medical Technology

IEEE

THE UNIVERSITY of WISCONSIN MADISON

AIAG

ASTM INTERNATIONAL
Standards Worldwide

ITRS

INTERNATIONAL TECHNOLOGY ROADMAP FOR SEMICONDUCTORS

USCAR

AMERICAN INDUSTRY / GOVERNMENT EMISSIONS RESEARCH
AIGER
Cooperative Research and Development Agreement

NIST has... ...strong partnerships

Agilent Technologies

DOW
Living.
Improved daily.

Ford

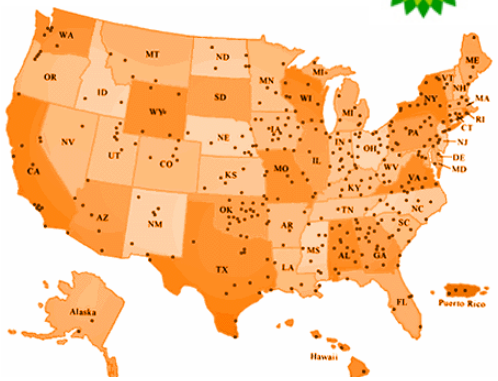
Pfizer

GM

IBM

bp solar

intel



NCMS
Manufacturing Trust

THE 100 BEST RESOURCES FOR SMALL BUSINESS
DANIEL KEHRER BizBest

VLSI Standards Incorporated

Homeland Security

National Institutes of Health

United States Department of Health & Human Services

NASA

National Cancer Institute

THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

Smart But Tough Budget Choices

The President's FY 2006 budget for TA/NIST is a smart budget that includes impressive increases for research and development programs.

- NIST's Laboratories program reflects an increase of $47.2M, or 12.7 percent over the FY 2005 appropriation.
- The proposed budget for TA reflects the same kind of difficult budgetary choices that have been made throughout the U.S. government.
- These tough choices necessitate the elimination of the Advanced Technology Program and the reduction for the Hollings Manufacturing Extension Partnership Program.

NIST FY 2006 Budget Request ($M)

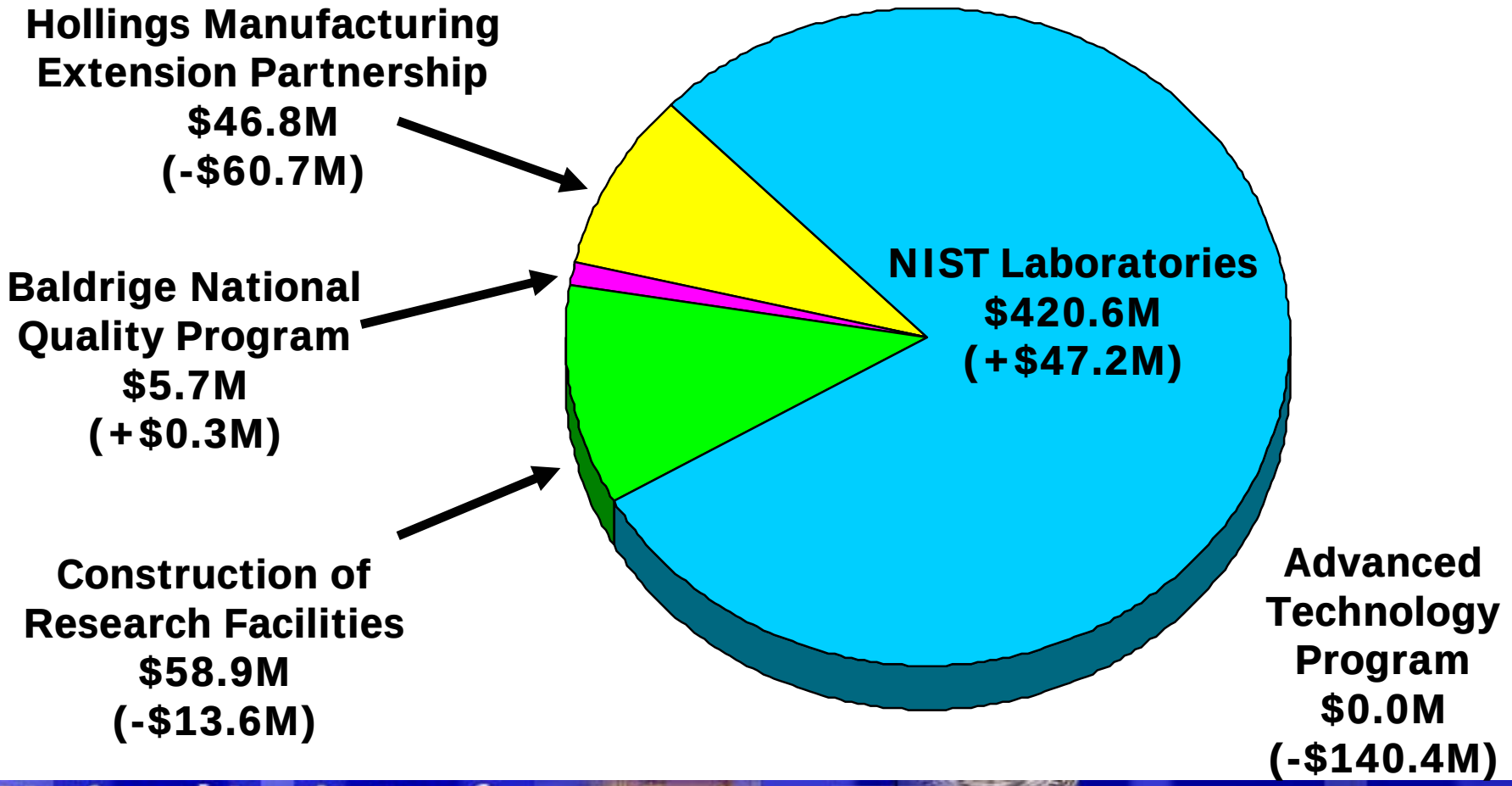
Appropriation:	FY 2004 Enacted	FY 2005 Enacted	FY 2006 Request
Scientific & Technical Research & Services (STRS):			
NIST Laboratories	335.1*	373.4 *	420.6
Baldrige National Quality Program	5.6	5.4	5.7
Subtotal, STRS	340.7	378.8	426.3
Industrial Technology Services (ITS):			
Advanced Technology Program	177.3	140.4	0.0
Hollings Manufacturing Ext. Partnership	39.2	107.5	46.8
Subtotal, ITS	216.5	247.9	46.8
Construction of Research Facilities (CRF):			
Construction and Major Renovations	20.9	6.9	23.9
Modifications and Improvements	22.6	22.7	35.0
Directed Grants	20.8	42.9	0.0
Subtotal, CRF	64.3	72.5	58.9
Total	621.5	699.2	532.0

FY 2004 and FY 2005 amounts do not reflect rescissions of unobligated balances.

****Congressionally-directed STRS grants included: $13.8M STRS in 2004; $8.8M in 2005.***

NIST FY 2006 Budget Request to Congress (Compared to FY 2005 Enacted)

Total FY 2006 Request: $532.0M



NIST FY 2006 Budget Increases for the NIST Laboratories

- Provide the measurement and standards infrastructure to support **Advances in Manufacturing (+$19.6M)**
- Provide the measurement and standards infrastructure necessary to improve **Measurements and Standards for Homeland Security (+$3.0M)**
- Explore **New Measurement Horizons for the U.S. Economy and Science** to anticipate and respond to the needs of the Nation's scientific and industrial communities in rapidly developing technology areas **(+$17.2M)**

Advances in Manufacturing (+$19.6M)

Advances in measurement technology are needed to support sustained, superior innovation in 21st century manufacturing.

NIST solutions:

Four strategic measurement capabilities and activities with an emphasis on cooperative research with the private sector:

- National Nanomanufacturing and Nanometrology Facility (+$10.0M)
- Nanomanufacturing Research (+$4M)
- Manufacturing Enterprise Integration (+$1.6M)
- Expanding Access to Global Markets through Measurements and Standards (+$4.0M)

Advances in Manufacturing

National Nanomanufacturing and Nanometrology Facility (+$10.0M)

Research and partnerships to translate nanoscience innovation into manufacturing jobs and economic growth.

- Leverage the unique resource provided by the recently completed NIST Advanced Measurement Laboratory
- Develop *Instrumentation Research, Metrology, and Standards for Nanotechnology,* an overarching goal in the National Nanotechnology Initiative Strategic Plan
- Develop nanoscale measurement and fabrication technologies

Advances in Manufacturing

Nanomanufacturing Research(+$4.0M)

- Measurements and standards will be developed in the areas of nanodevices, nanomagnetics, nanomanipulation, and nanocharacterization for the developing nanotechnology industry
- Work will utilize the world's best measurement and nanometrology research facility, the AML
- The AML measurements can be accurately made at the scale of individual atoms
- This program will leverage the AML investments and make its benefits immediately accessible to U.S. nanomanufacturing researchers through the National Nanomanufacturing and Nanometrology Facility (N3F)

Advances in Manufacturing

Manufacturing Enterprise Integration (+$1.6M)

Open new global markets to small manufacturers by enabling them to communicate electronically with business partners.

- Excess costs to U.S. economy due to poor supply chain efficiency:
  - automotive industry: $5.0B/yr
  - electronics industry: $3.9B/yr
  - construction industry: $15.8B/yr
- Work with private sector to enable development of technically sound and unbiased standards critical for e-business
- Provide level of quality required for trust and confidence in transactions

Advances in Manufacturing

Expanding Access to Global Markets through Measurements and Standards (+$4.0M)

Retain and create U.S. manufacturing jobs by meeting the international standards challenge.

- Improve U.S. manufacturing productivity by providing efficient access to NIST measurement traceability
- Align U.S. standards for measuring instruments with international standards for seamless export
- Provide technical leadership and coordination to
  - ease access to foreign markets
  - ensure that U.S. interests are fairly represented

Measurements and Standards for Homeland Security (+$3.0M)

Through interdisciplinary measurements and standards, NIST is helping law enforcement, the military, emergency services and others to protect America from terrorist threats.

NIST solutions:

Two public safety and security programs to ensure delivery of infrastructural support essential to meeting critical safety and homeland security goals:

- Improved standards and guidelines for first responders and buildings (+$2.0M)
- Biometrics (+$1.0M)

New Measurement Horizons for the U.S. Economy and Science (+$17.2M)

The Nation's scientific and industrial communities are challenged to keep pace with fast-breaking developments at the forefront of science and technology.

NIST solutions:

Advanced measurements, standards, and services to promote innovation in three rapidly developing technology areas:

- Biosystems and Health (+$7.2M)
- Interoperability and Security for Emerging Scientific Systems (+$2.0M)
- Quantum Processing—Beyond High-End Computing (+$4.0M)
- Building Competence for Advanced Measurements (+$4.0M)

New Measurement Horizons for the U.S.Economy and Science

Biosystems and Health (+$7.2M)

Accelerate U.S. global success in bio-innovation, manufacturing, and trade.

- Integrate the quantitative, physical sciences with biosystems and health arena for technology innovation
  - Bioinformatics--marriage of molecular biology with computer science
  - BioImaging--measurement science necessary to collect, analyze and store images reproducibly and securely
  - Measurement tools for gene and protein expression--enabling the discovery of new pharmaceuticals and of the causes of diseases

New Measurement Horizons for the U.S. Economy and Science

Interoperability and Security for Emerging Scientific Systems (+$2.0M)

Build trust, confidence, and usability in future scientific systems.

- Develop fundamental standards and measurements for emerging systems such as UPC code-replacing Radio Frequency Identification (RFID) tags for product identification

- Maximize the performance and security of future components, systems, and networks

New Measurement Horizons for the U.S. Economy and Science

Quantum Processing—Beyond High-End Computing (+$4.0M)

Develop the measurements and standards to enable quantum information science, which will likely revolutionize science and technology and produce tremendously powerful computing capabilities.

- Conduct world-leading research effort
- Develop prototype quantum processors
- Explore new approaches to computer architectures needed for quantum computing
- Develop understanding of quantum processors' memory control and of quantum languages, resulting in new information metrics and protocols

New Measurement Horizons for the U.S. Economy and Science

Building Competence for Advanced Measurements (+$4.0M)

Provide seed funds to explore high-risk, leading-edge research concepts that anticipate entirely new future measurement and standards needs of industry.

- Expand the scope and nature of the awards toward the development of multidisciplinary research projects that have greater visionary scope and impact

- Select and initiate several innovative strategic projects per year so that the total Competence Program represents approximately 5 percent of the total NIST Laboratories' efforts

NIST FY 2006 Budget Request for Industrial Technology Services

Budget constraints have required some tough budget decisions.

- **Advanced Technology Program (- $140.4M):**
  - No funding requested for FY 2006
- **Hollings Manufacturing Extension Partnership (- $60.7M):**
  - Decrease reflects Administration's policy and funding priorities

NIST FY 2006 Budget Request for Construction of Research Facilities Appropriation (+$35.4M)

The single most pressing facilities issue for NIST is the growing obsolescence due to aging.

NIST solutions:

- Facilities Improvements (+$32.0M)
- Maintenance for the Advanced Measurement Laboratory (+$3.4M)