

Strengthening Planning and Performance for NIST Measurement Services

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NIST Role in Measurement

- Equitable commerce depends on a stable monetary system and a reliable system of measurement – a fact recognized by the U.S. Constitution.

“The Congress shall have power To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures”

U.S. Constitution, Article I, Section 8

Reliable measurements are also important to the health, safety and well-being of society at large.



- NIST provides the basic measurement infrastructure of the U.S.

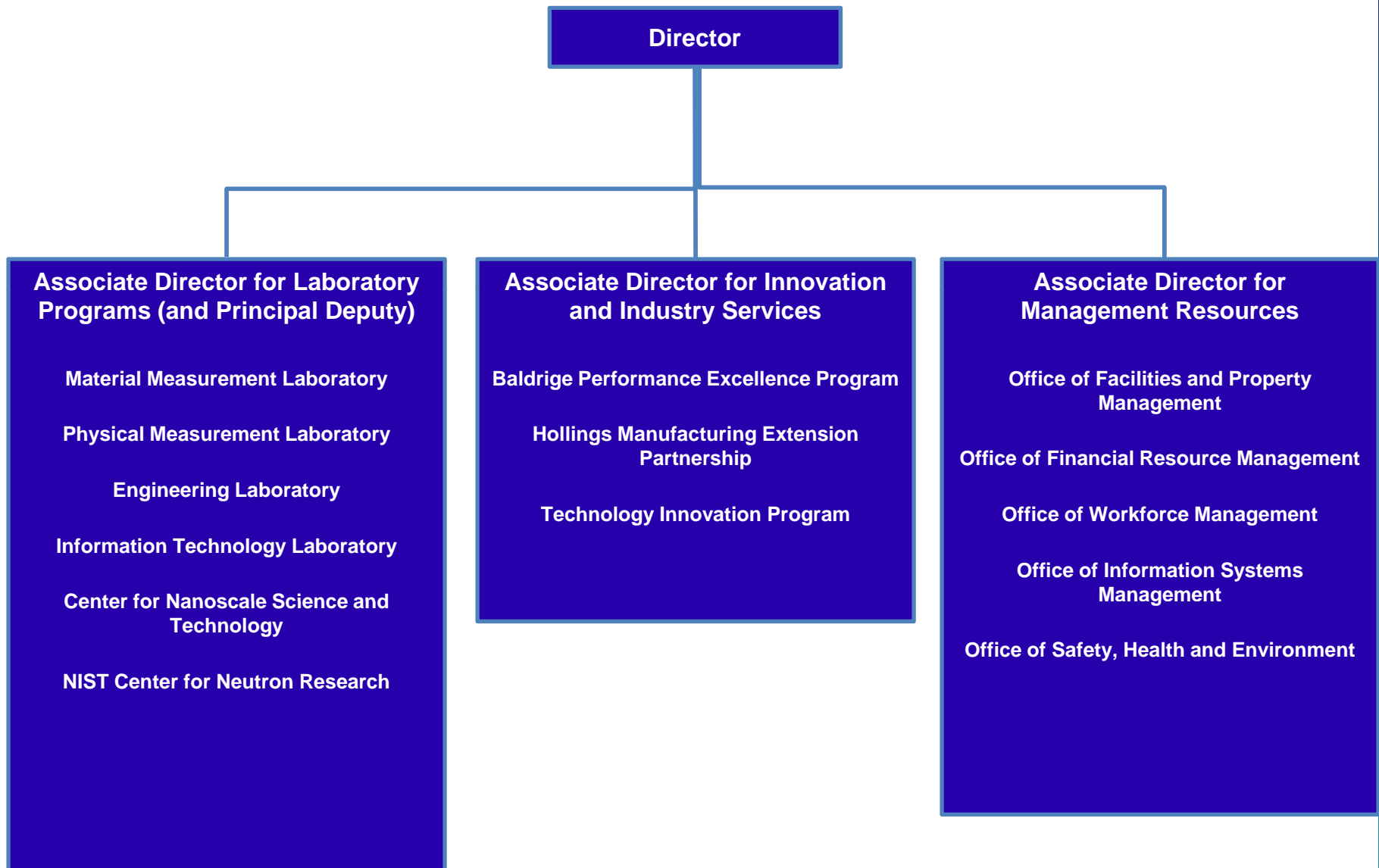
“To develop, maintain, and retain custody of the national standards of measurement and provide the means and methods for making measurements consistent with those standards.”

15 USC 271 2(b)(2)

NIST

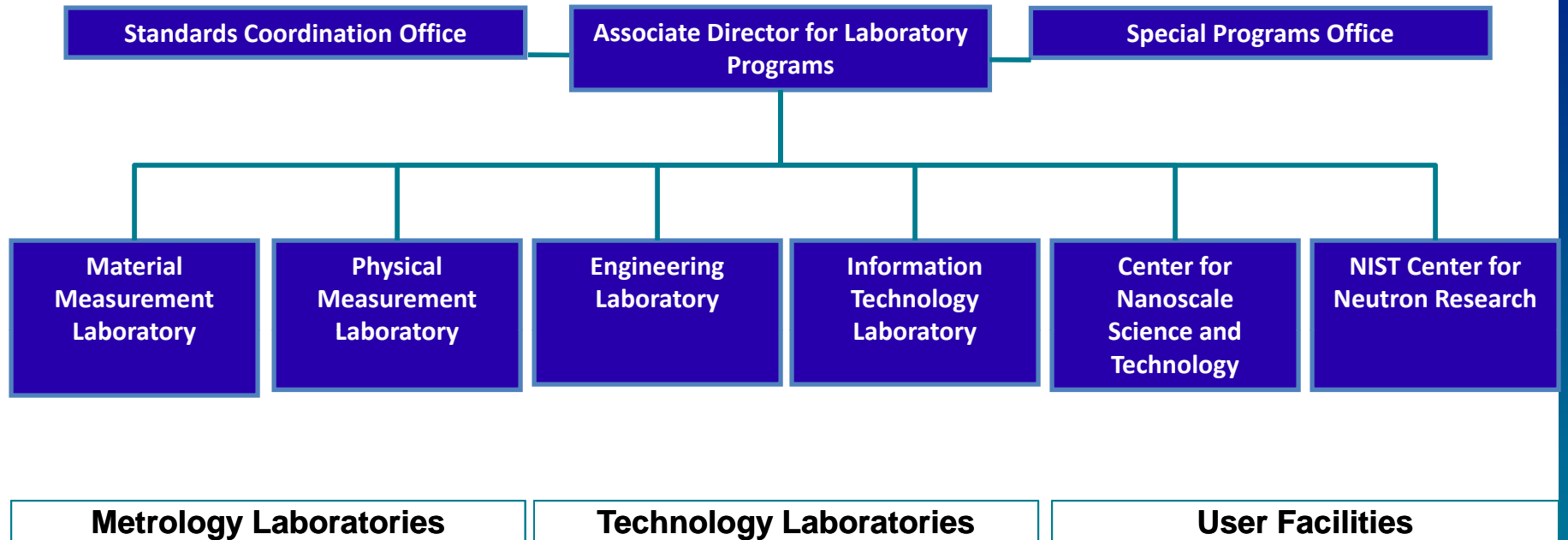
- The NIST Measurement Services are the means by which the physical, chemical and biological measurement infrastructure is supported at the appropriate level of uncertainty via unbroken chains of traceability to internationally recognized standards.

NIST Realigned Organizational Structure



NIST Realignment

Structure of the Laboratory Programs



NIST Measurement Services

Focus should be on how the NIST metrology laboratories deliver their mission, not necessarily on a specific set of services.

- Development and dissemination of validated **measurement methods and protocols**
- Development and dissemination of new **measurement instruments**
- **NIST Traceability:**
 - Standard Reference Data (SRD)
 - Standard Reference Materials (SRMs)
 - Calibration Services

Ensure that industry-performed measurements are traceable to NIST standards
- Development of **testing protocols** and the support of **laboratory accreditation** programs enable the NIST Laboratories to directly support U.S. innovation and industrial competitiveness

Impact of NIST Measurement Services

For over a century, the measurement services programs of NIST have ensured the accuracy and reliability of nearly all measurements in the United States.

- **U.S. Industry and the Consumer**

NIST distributes over 1200 different Standard Reference Materials that assure the accuracy of millions of measurements made daily in medical clinics, manufacturing plants and industrial labs throughout the United States. For example, NIST SRMs for sulfur in fossil fuels enable fuel producers to more efficiently formulate products that meet the varying regulatory requirements of different markets.



- **Federal Agencies**

NIST measurement programs provide critical federal agencies such as the DoD, DoE, FAA, EPA, and NASA, with the measurement support necessary to carry out their mission. For example, In 2009 NIST performed 203 calibrations for DoE that supported over 70,000 subsequent calibrations in support of the reliability and performance of the entire U.S. nuclear arsenal.



- **State Agencies**

NIST calibrations are critical for all state weights and measures offices. In 2006 and 2007, 16 NIST calibrations for mass, volume, temperature, and length underpinned more than 360,000 calibrations done by state laboratories.



Areas of concern

- Needs assessment and analysis
- Program design (e.g. how does NIST provide traceability).
- Program execution
- Pricing, delivery and other service considerations
- Staffing
- Performance metrics
- Assessment

Path Forward

- Identify measurement needs
- Analyze the position of NIST measurement services in a particular measurement system.
- Develop detailed plans for the development and delivery of NIST measurement services – plans will address:
 - vertically integration of the measurement activities,
 - long term and near term goals
 - appropriate milestones and metrics
- Managing programs according to plans
- Review process for both services and research activities



Discussion

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SRM



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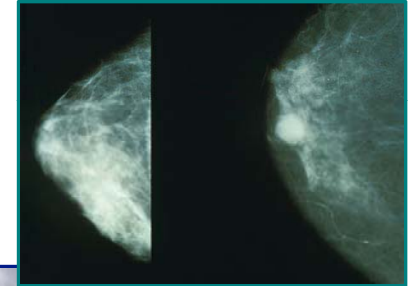
- **Air Force**

8 NIST calibrations performed annually for the Air Force **underpin 22,000** high voltage calibrations + **158,000 AC** measurements + 77,000 inductance calibrations + over **400,000 DC voltage calibrations**. These calibrations support the F-16 Fighting Falcon program, the accuracy of fuel gauges on every AF aircraft, the F-22 weapons system, and components on the F-15.



- **X-ray Mammography**

by law, all 11,000 mammography x-ray clinics in the U.S. **must be traceable to NIST standards**.



- **Nuclear equipment**

the NIST Mn bath is the foundation of all **neutron calibrations** in the U.S., which **impact** the U.S. **nuclear weapons** programs, **nuclear power plants**, and all **nuclear-powered equipment**.



- **Electric Power**

NIST-traceable **calibrations ensure the accuracy of** over 100 million electric power meters in the U.S. that measure the cost of over **\$300 billion worth of electricity** annually. Electric utilities are totally dependent upon NIST calibration services to prove the accuracy of all of these transactions.



Impact of NIST Measurement Services

▪ Length

for dimensional metrology, NIST calibrates over 5,000 master gauges each year. **Each gauge block calibration explicitly controls a thousand subsequent gauge block calibrations performed in industrial laboratories.**



▪ Pharmaceutical Dosing

the pharmaceutical industry relies on NIST-traceable **mass measurements** to **ensure accurate dosing** of medicines **at the sub-milligram level.**



▪ Temperature

instrument vendors, as well as pharmaceutical, chemical, aerospace, microelectronic, and petroleum industries rely on **NIST's thermometry and humidity measurement services** to establish accuracy, which **enables the manufacturing and sale of their products in national and international markets.**



▪ Treatment Cost

cholesterol SRMs and a NIST-developed **method** has **led to an improvement in clinical diagnostic measurement precision** from over 20 % to 3 %. Treatment cost **savings** are estimated at **over \$100 million per year.**

