Overview of the National Nanotechnology Initiative (NNI) and Related Federal Initiatives

Dr. Altaf H. Carim

Assistant Director for Nanotechnology

Office of Science and Technology Policy

Executive Office of the President

2012 Regional, State, and Local Initiatives in Nanotechnology Workshop

Portland, OR   May 1, 2012

What is "Nanotechnology"? The NNI definition:

- Nanotechnology is the understanding and control of matter at dimensions between approximately 1 and 100 nanometers, where unique phenomena enable novel applications.

- Encompassing nanoscale science, engineering, and technology…

- …nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale.

- Not just miniaturization: fundamental differences in physical, chemical, and biological behavior compared to bulk materials or individual atoms/molecules (quantum behavior; surface dominance; self-assembly; collective phenomena)

- Note that the US has maintained a consistent definition of nanotechnology (above), which is the basis for identification and federal coordination of activities (NNI Strategic Plans 2004, 2007, 2011, and other documents)

- Some agencies may need further clarification to meet their missions, but use of the term "nanotechnology" should be consistent with the existing definition.

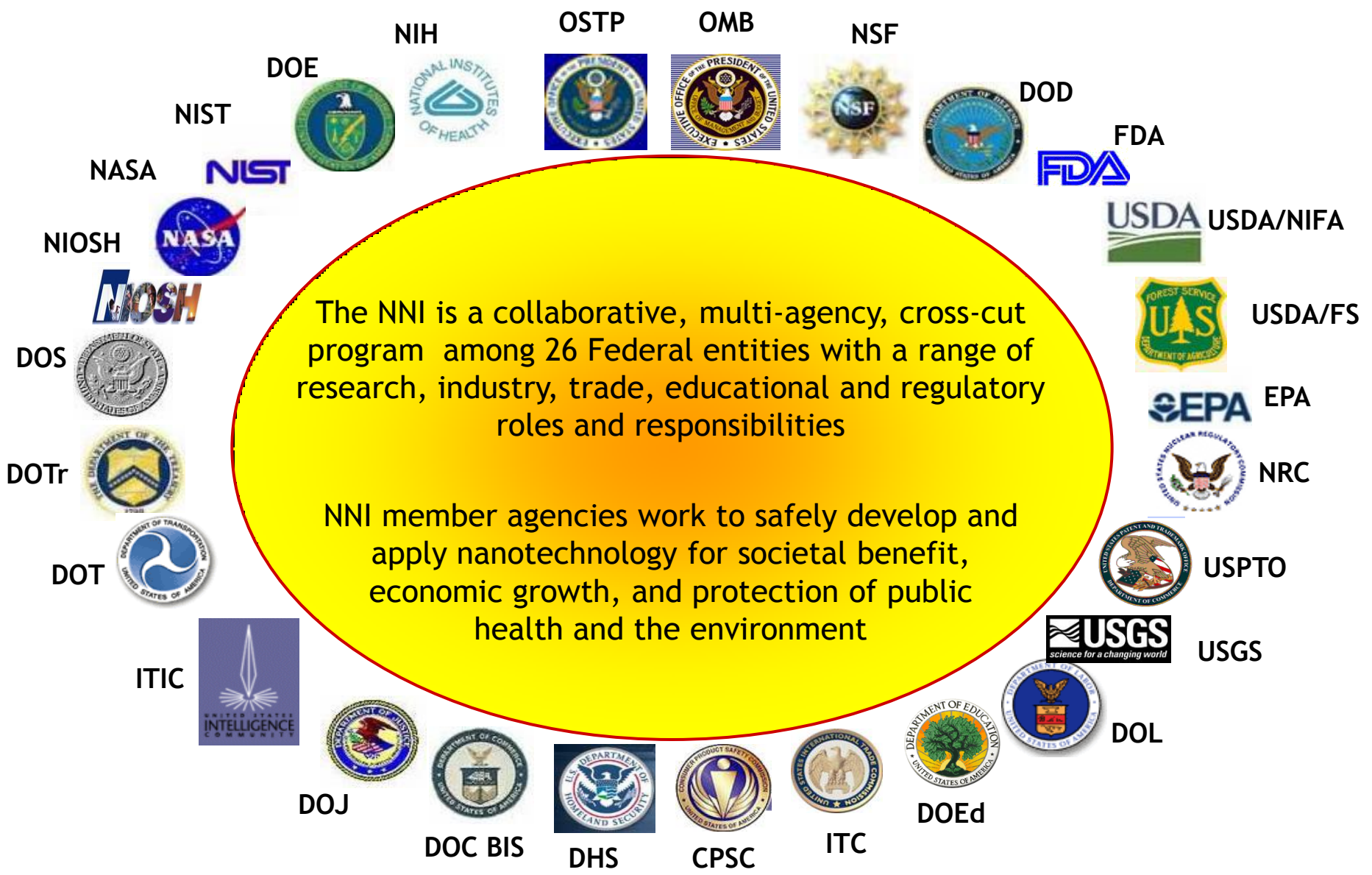# The U.S. National Nanotechnology Initiative

Vision:

- A future in which the ability to understand and control matter at the nano-scale leads to a revolution in technology and industry that benefits society.

Scope:

- Broad and inclusive, ranging from fundamental research through development and commercialization, and across all technical areas

- NNI Signature Initiatives highlight key topics with particular promise for acceleration through focused interagency effort: nanoelectronics, sustainable nanomanufacturing, solar energy

- Total Federal investments now ~$1.8 billion annually

- A governmental *initiative*, representing a priority area for investment and activity, but not a distinct *funding program* with separate budget authority
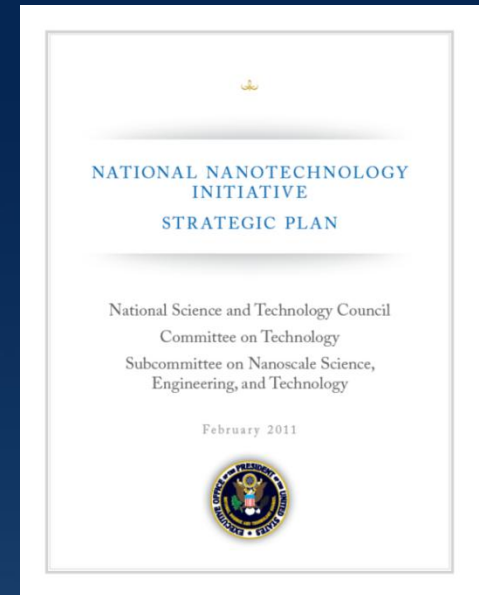
NIH OSTP OMB NSF

DOE DOD

FDA

NIST

USDA/NIFA

NASA

USDA/FS

NIOSH

EPA

DOS

NRC

DOTr

USPTO

DOT

USGS

ITIC

DOL

DOJ

DOEd

DOC BIS DHS CPSC ITC

The NNI is a collaborative, multi-agency, cross-cut program among 26 Federal entities with a range of research, industry, trade, educational and regulatory roles and responsibilities

NNI member agencies work to safely develop and apply nanotechnology for societal benefit, economic growth, and protection of public health and the environment

The NNI's triennial Strategic Plan, and overarching Goals

- Most recent NNI Strategic Plan of February, 2011 updates the prior strategic plans of 2007 and 2004

- Sets forth the four ongoing NNI goals:

    1. Advance a world-class nanotechnology research and development program

    2. Foster the transfer of new technologies into products for commercial and public benefit

    3. Develop and sustain educational resources, a skilled workforce, and the supporting infrastructure and tools to advance nanotechnology

    4. Support responsible development of nanotechnology

    and provides information on specific objectives supporting them

NATIONAL NANOTECHNOLOGY INITIATIVE STRATEGIC PLAN

National Science and Technology Council
Committee on Technology
Subcommittee on Nanoscale Science, Engineering, and Technology

February 2011

- Describes Program Component Areas (PCAs), agency interests and priorities, coordination and assessment structures and mechanisms, collaborative agency activities and plans, and stakeholder input
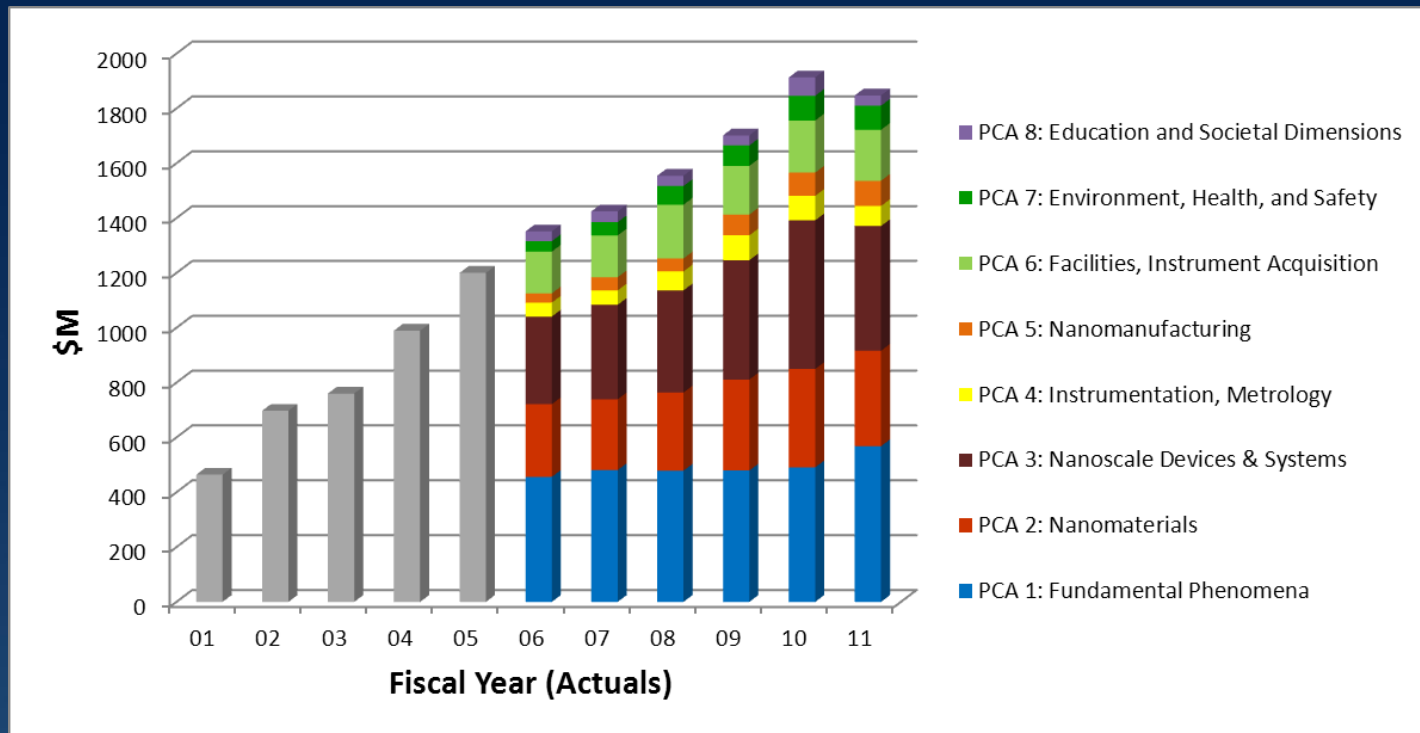
NNI Environmental, Health, and Safety (EHS) Research Strategy
(published October, 2011)

National Nanotechnology Initiative
ENVIRONMENTAL, HEALTH, AND SAFETY RESEARCH STRATEGY

National Science and Technology Council
Committee on Technology

Subcommittee on Nanoscale Science, Engineering, and Technology

OCTOBER 2011

- A comprehensive and more sophisticated follow-up to initial strategy (2008) and identification of research needs (2006)

- Serves as guidance to Federal agencies regarding research activities, priorities, and program planning

- Identifies six core nanoEHS research categories, assesses status in each

  - Nanomaterial Measurement Infrastructure

  - Human Exposure Assessment

  - Human Health

  - Environment

  - Risk Assessment and Risk Management Methods

  - Informatics and Modeling for NanoEHS Research

NNI Investments

- Considerable increases in total annual NNI investment: $464M in FY 2001, ~$1.8B now

- 8 Program Component Areas used to track investments across departments and agencies (since 2006)

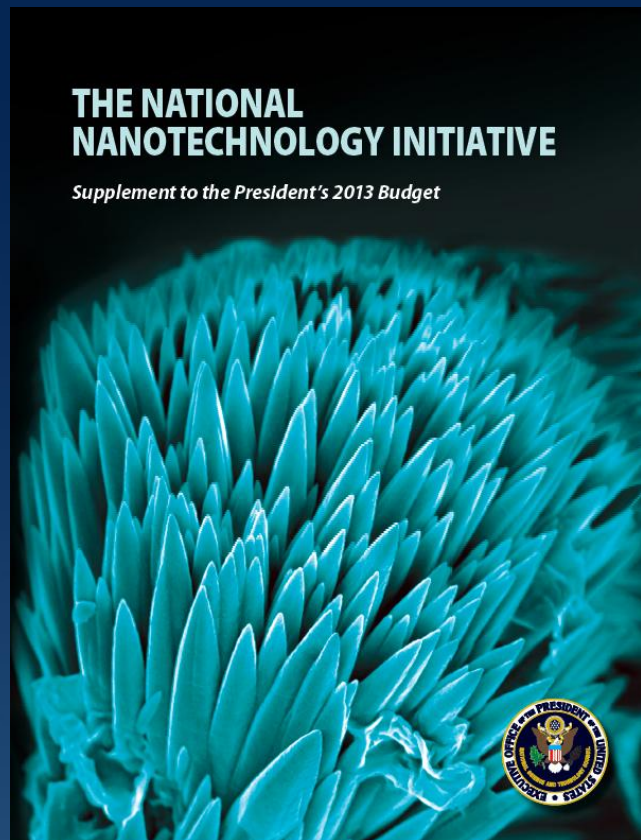# Evolution of NNI Investments: Selected PCAs

- Funding for more fundamental work maintained; large percentage increases for nanomanufacturing and for environment, health, and safety
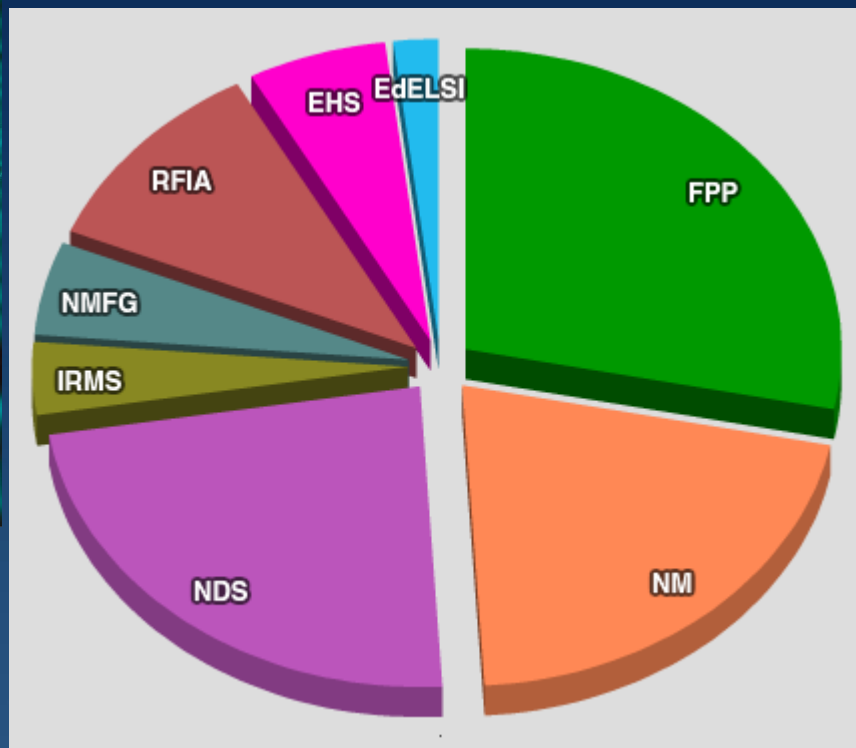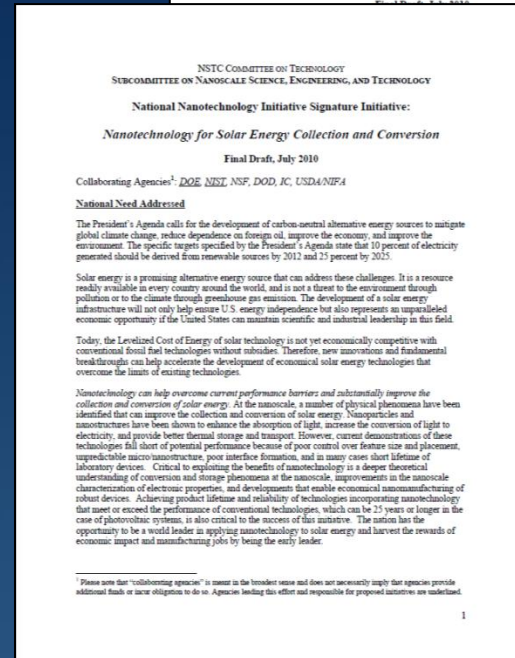
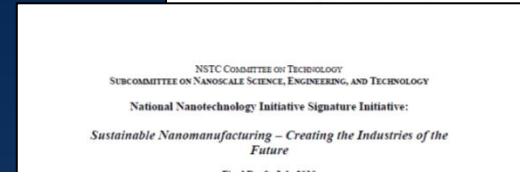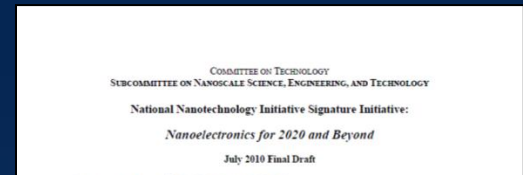# FY 2013 President's Budget Request for the NNI

THE NATIONAL NANOTECHNOLOGY INITIATIVE

Supplement to the President's 2013 Budget

- Total is $1.767 billion, across 15 agencies

- Includes growth over FY 2012 estimates in nanomaterials, nanomanufacturing, EHS

http://nanodashboard.nano.gov/

Several "NNI Signature Initiatives" have been identified

- Serve to spotlight areas of particular promise, existing effort, and significant opportunity – bridging across multiple federal agencies

- Current NSIs are in:
  - Nanotechnology for Solar Energy Collection and Conversion
  - Sustainable Nanomanufacturing
  - Nanoelectronics for 2020 and Beyond

- Intended to be dynamic; topical areas will likely be added and rotate/evolve over time.

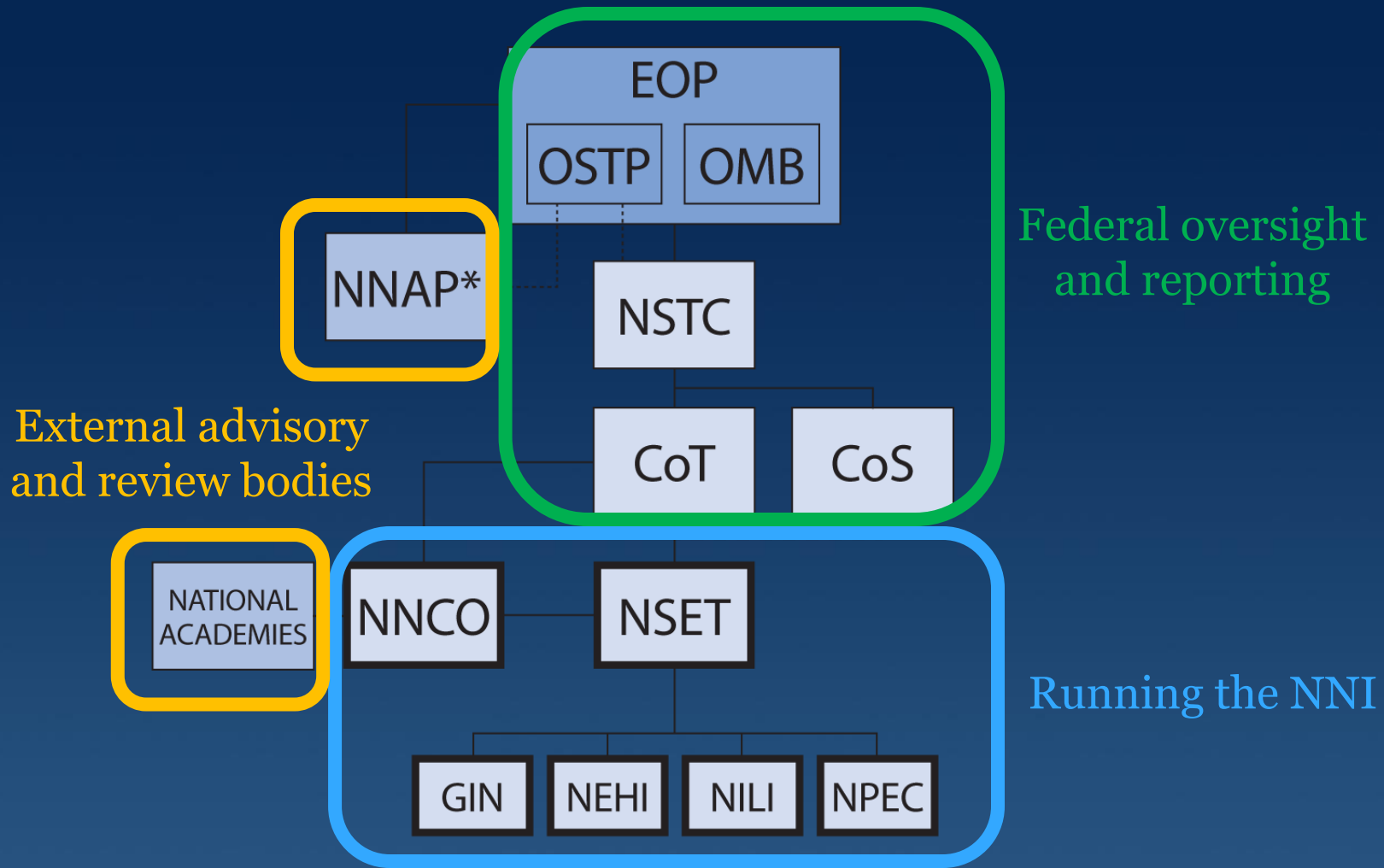# Responsibilities of OSTP and the S&T Advisor:

- Policy for science and technology

  – Analysis, recommendations, and coordination on R&D budgets and related policies, S&T education and workforce issues, interagency S&T initiatives, …

- Science and technology for policy

  – Independent advice for the President about S&T germane to all policy issues

OSTP-managed entities

- National Science and Technology Council (NSTC)

  - Internal body across federal agencies; nominally chaired by the President and includes the OSTP Director, Cabinet Secretaries, and S&T Agency Heads; coordinates S&T activities that cross agency boundaries

- President's Council of Advisors on Science and Technology (PCAST)

  - External advisory committee; members from academia, industry, NGOs; helps link White House to wider ST&I community

Organizational alphabet soup!

Federal oversight and reporting

External advisory and review bodies

Running the NNI

EOP
OSTP OMB
NNAP*
NSTC
CoT CoS
NATIONAL ACADEMIES
NNCO NSET
GIN NEHI NILI NPEC

The NNI remains a major administration priority

- Three major, ongoing interagency programs under NSTC have standing National Coordination Offices

  - Global Change Research Program (GCRP)
    – since 1989, 13 agencies, ~$2.1B

  - Networking and Information Technology Research and Development (NITRD)
    – since 1991, 16 agencies, ~$3.8B

  - National Nanotechnology Initiative (NNI)
    – since 2001, 25 agencies, ~$1.8B

- Other new initiatives also connect to activities under the NNI, including:

  - Materials Genome Initiative (MGI)

  - Advanced Manufacturing Partnerships (AMP)

- Nanotechnology and the NNI are highlighted in the President's Strategy for American Innovation, which repeatedly refers to the importance of standards

Materials Genome Initiative (MGI)

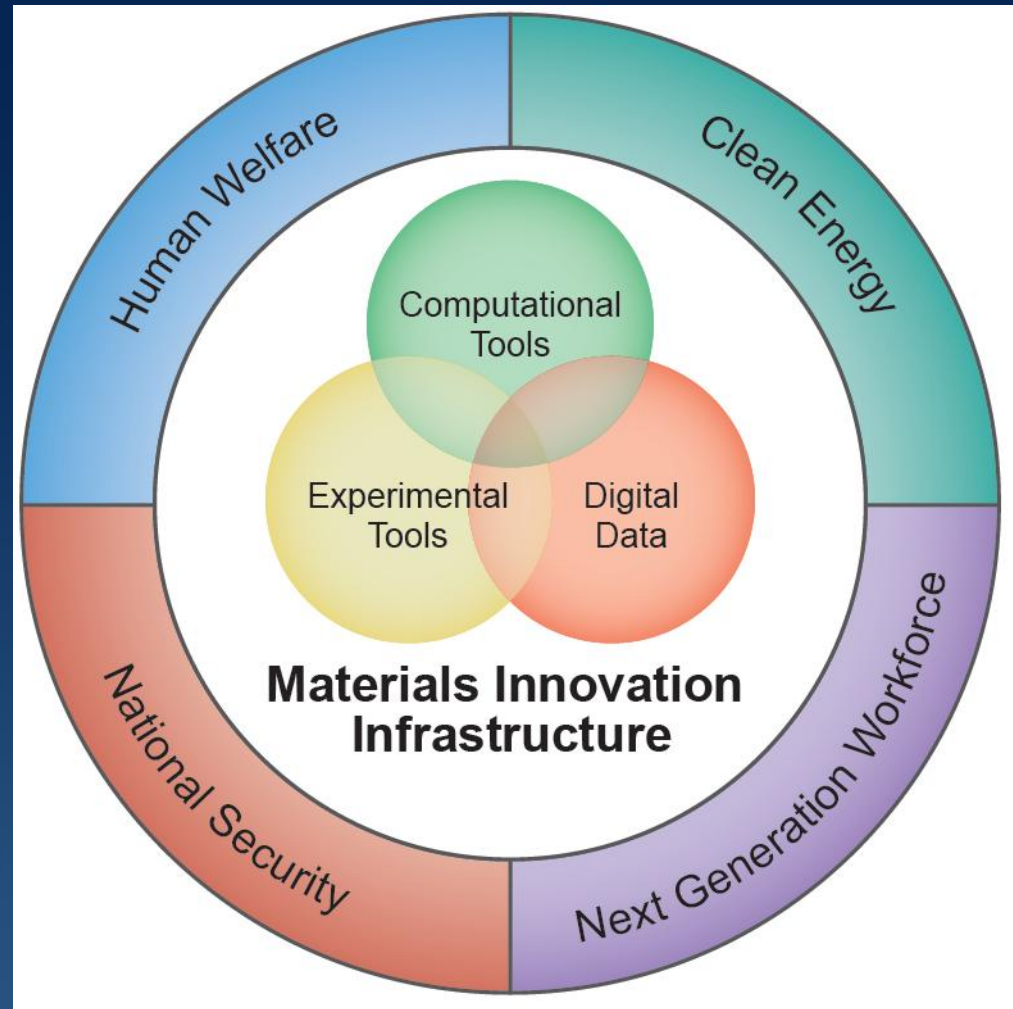Materials Genome Initiative
for Global Competitiveness

June 2011

- Announced by President Obama, concurrently with the Advanced Manufacturing Partnership, at Carnegie Mellon University in June 2011

- Objective is to reduce the time-to-market for advanced materials by over 50%

- Much as the genome of an organism defines its hereditary information, the materials genome evokes the notion of having enough fundamental information to predict properties and custom-design new materials

- Utilization of Integrated Computational Materials Engineering and similar approaches to accelerate materials discovery, development, optimization, design, certification, manufacturing, and deployment

Materials Genome Initiative (MGI) components

- Developing a materials innovation infrastructure, through advances in and integration of:

  - Computational tools

  - Experimental tools

  - Digital data and informatics

- Achieving National goals in energy, security, and human welfare with advanced materials

- Equipping the next generation materials workforce

Advanced Manufacturing Partnership (AMP)

REPORT TO THE PRESIDENT ON ENSURING AMERICAN LEADERSHIP IN ADVANCED MANUFACTURING

A NATIONAL STRATEGIC PLAN FOR ADVANCED MANUFACTURING

Executive Office of the President
National Science and Technology Council

FEBRUARY 2012

- Collaboration of industry, universities, and other stakeholders with the federal government
  - Governmental framework: Interagency Working Group
  - Non-governmental framework: PCAST

- Identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

- PCAST report June 2011, NSTC strategic plan February 2012, other reports/announcements on the web and in progress

Advanced Manufacturing Partnership (AMP):
The National Network for Manufacturing Innovation

- **$1 billion FY13 proposal:** "institutes of manufacturing excellence where some of our most advanced engineering schools and our most innovative manufacturers collaborate on new ideas, new technology, new methods, new processes"

- **$45 million FY12 pilot:** "Later this year, we're going to choose the winner of a competition for a pilot institute for manufacturing innovation -- help them get started."

http://manufacturing.gov/amp/
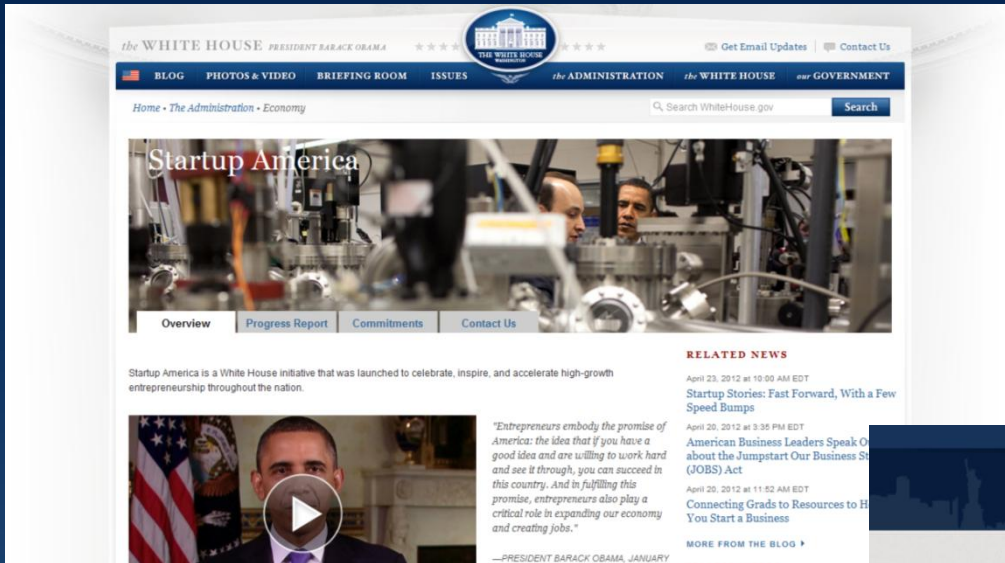pilot-institute.html

Startup America

- Started in early 2011, Startup America is a White House-led initiative to celebrate, inspire and accelerate high-growth entrepreneurship across the country

- Young companies are responsible for virtually all new job growth across the U.S.; we are committed to creating the best possible climate for entrepreneurial success

- Efforts on three fronts:
    - Taking administrative action
    - Mobilizing the private sector
    - Calling on Congress

- Progress on and proposals in priority areas, including:
    - immigration
    - unlocking access to capital
    - connecting mentors to entrepreneurs
    - reducing barriers in patents and other areas
    - cutting taxes on small businesses
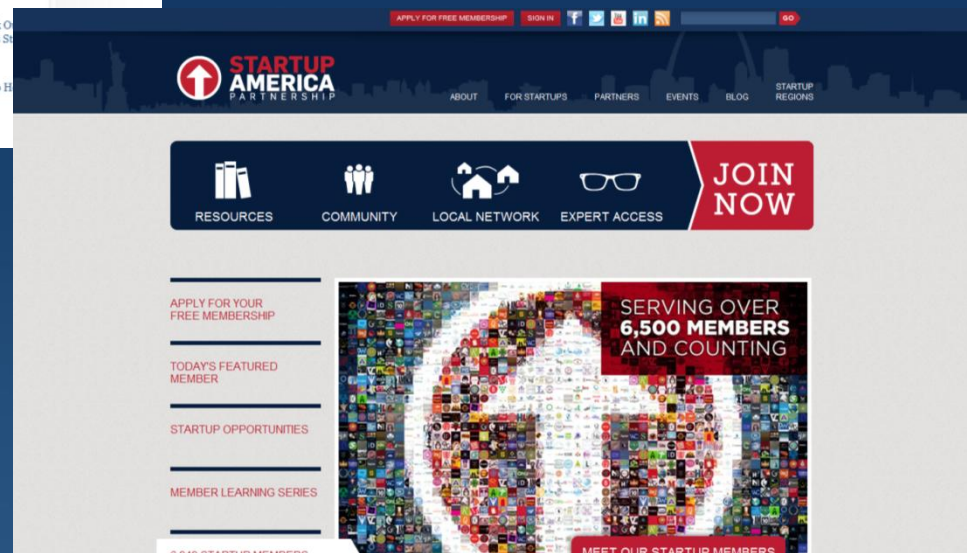   - accelerating innovation from lab to market for federally funded R&D

Startup America:
websites for much more information…

http://whitehouse.gov/startupamerica

http://www.s.co/

Nano.gov
National Nanotechnology Initiative

Leading to a revolution in technology and industry that benefits society

NNCO Welcomes New Director

Dr. Robert Pohanka joins NNCO after serving as Director of the DoD's Defense Venture Catalyst Initiative (DeVenCI), where he led and directed the strategy for finding private sector technologies and bringing them to the marketplace.

Learn More >>

1 2 3 4 5

Visit the NNI Budget Dashboard>>

Regional, State, and Local Initiatives in Nanotechnology Workshop (RSL 2012)
Limited travel support is now available for

regional**state**local

Nanotechnology News

Researchers present a shiny new tool for imaging biomolecules
Mar 23, 2012 - PhysOrg.com

Double Precautionary Principle Danger: A Robot Built With Nanotubes
Mar 23, 2012 - Science 2.0

What is Nanotech?   What are the Benefits?   How is the NNI Helping?

※ Nanotechnology is the understanding and control of matter at the nanoscale, at dimensions between approximately 1 and 100 nanometers, where unique phenomena enable novel applications.

※ Encompassing nanoscale science, engineering, and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale.

※ So how small is "nano"? A nanometer is one billionth of a meter. A sheet of paper is about 100,000 nanometers thick. And there are 25,400,000 nanometers in one inch.

See more in Nano 101

Nanotechnology