



# Critical Bridges for Nanotechnology Innovation

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# Why bridges?

- Disciplines
- Sectors
- Stakeholders
- Countries
- Production capabilities
- *Essential for innovation of emerging technology*



# Technology Innovation

- *"Whether it is improving our health or harnessing clean energy, protecting our security or succeeding in the global economy, our future depends on reaffirming America's role as the world's engine of scientific discovery and innovation."*

– President Barack Obama





# Strategy for American Innovation

*Sustainable growth*  
*New jobs, businesses, industries*

**Catalyze Breakthroughs for National Priorities**

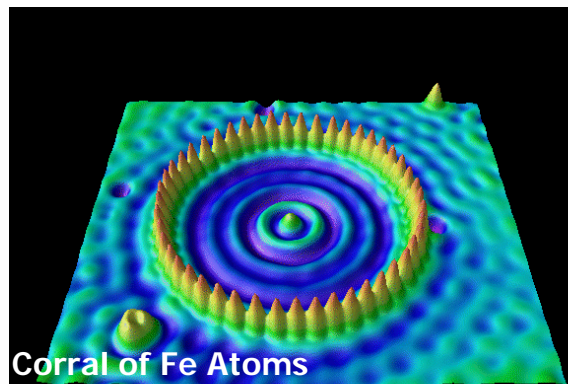
**Promote Competitive Markets that Spur  
Productive Entrepreneurship**

**Invest in the Building Blocks of American Innovation**



# What is nanotechnology?

- Nanotechnology is the **understanding and control** of matter at dimensions between approximately **1 and 100 nanometers (the nanoscale)**, where **unique phenomena** enable novel applications.
- Nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale



Corral of Fe Atoms

Source: Don Eigler



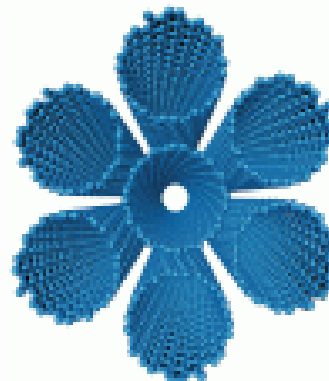
# Nanotechnology Innovation

- **What is the same?**
  - Goals of innovation historically
  - Types/approaches
  - Dealing with unknowns
- **What is different/unique about nanotechnology innovation?**
  - Scale
  - Control/manipulation/engineering
  - Novel resultant properties



# Nanotechnology Innovation

- **What is different/unique about nanotechnology innovation?**
  - Breadth and speed
    - New products and processes with unique and transformational characteristics.
    - Far-reaching impact
      - Materials
      - Energy,
      - Health and medicine
      - Electronics
      - And many more
      - Agriculture
      - Construction
      - Transportation
      - Consumer products
  - Specific, intentional focus since 2001



**NATIONAL  
NANOTECHNOLOGY  
INITIATIVE**





# National Nanotechnology Initiative

## Vision and Goals

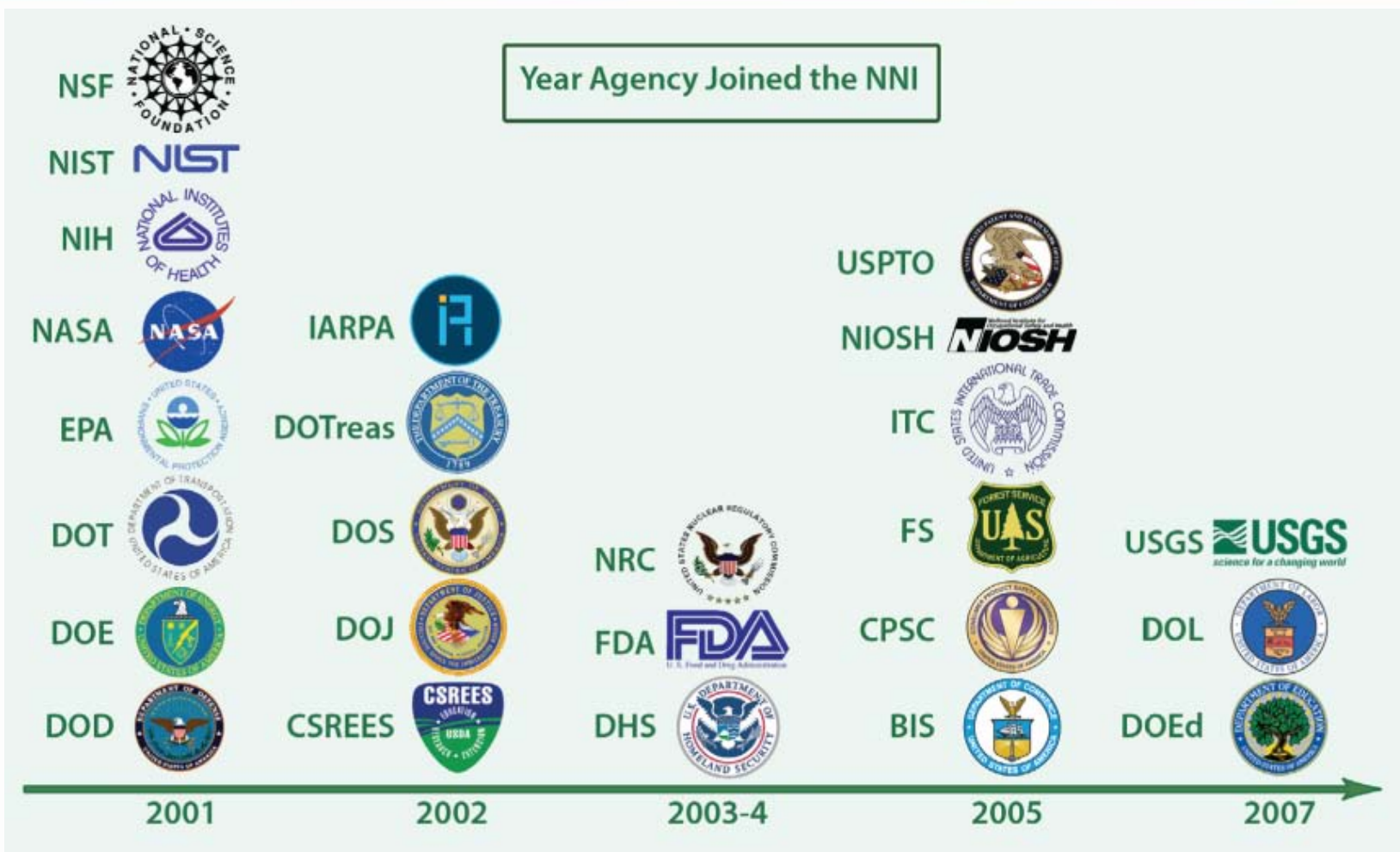
*A future in which the ability to understand and control matter on the nanoscale leads to a revolution in technology and industry that benefits society*

1. Advance a **world-class research and development** program
2. Foster **technology transfer** for commercial & public benefit
3. Develop & sustain **educational resources**, a skilled workforce, and the supporting research **infrastructure** and tools
4. Support **responsible development** of nanotechnology



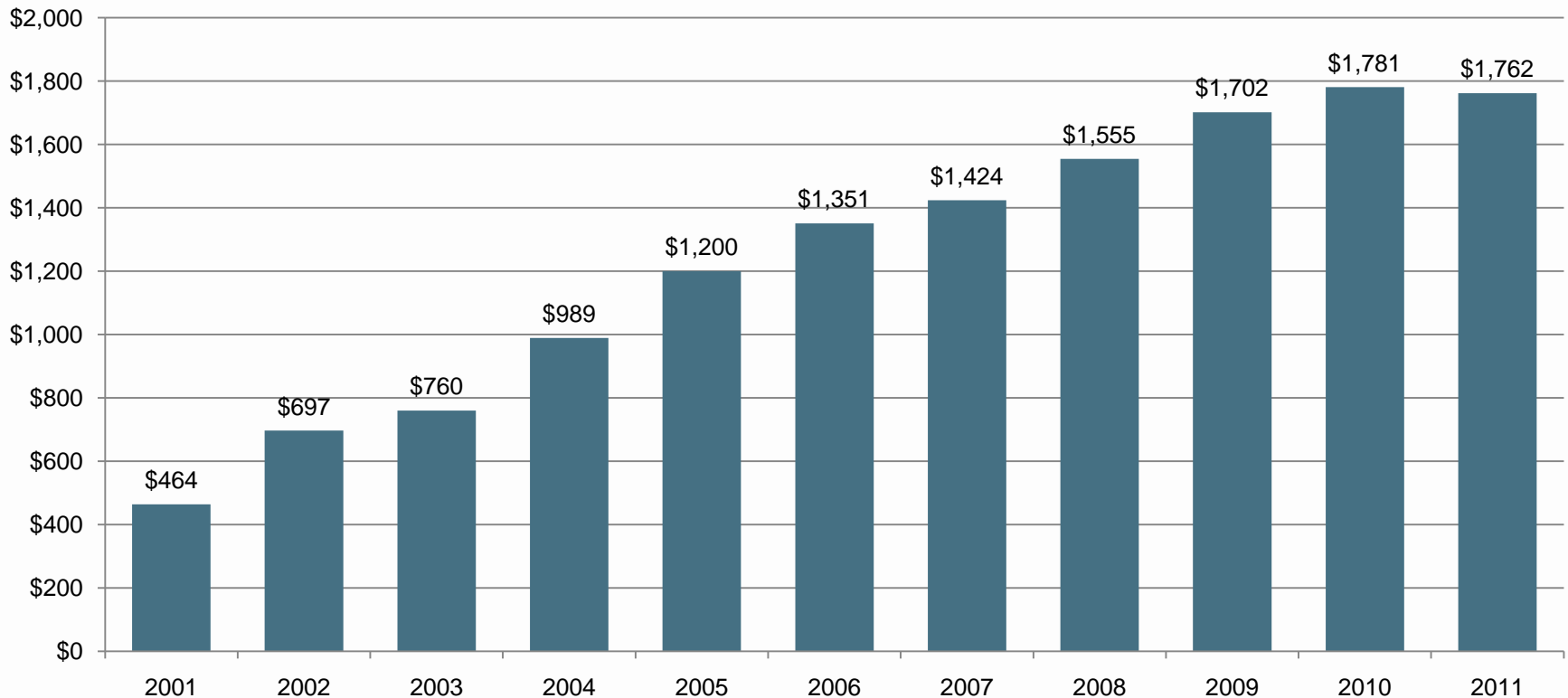


# National Nanotechnology Initiative Participating Agencies





# National Nanotechnology Initiative Investment History



Collective agency funding (in \$ millions) reported since NNI inception  
(FY 2010 estimated; **FY 2011 request \$1.76 billion**)



# National Nanotechnology Initiative FY2010 Budget by Area

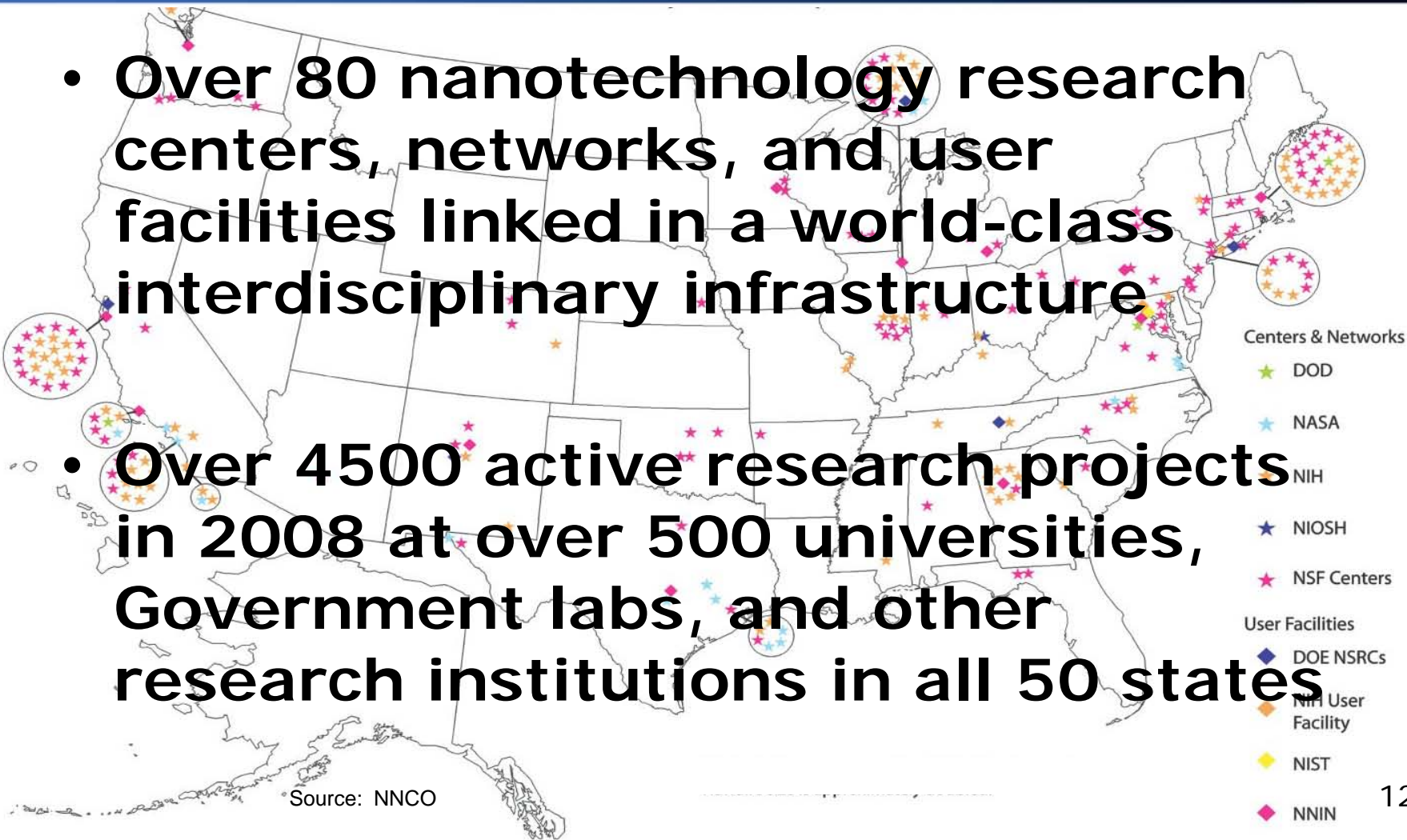
6 - Major Research Facilities and Instrument Acquisition \$218.7	7 - EHS \$87.7	8 - Education and Societal Issues \$36.1	1 - Fundamental Nanoscale Phenomena and Processes \$507.0
5 - Nanomanufacturing \$53.7			
4 - Instrumentation Research, Metrology, and Standards \$84.2			
3 - Nanoscale Devices and Systems \$354.7			2 - Nanomaterials \$296.8

Program Component Areas – \$ in millions; total = **\$1.64 billion**



# National Nanotechnology Initiative Infrastructure – Centers and Networks

- **Over 80 nanotechnology research centers, networks, and user facilities linked in a world-class interdisciplinary infrastructure**
- **Over 4500 active research projects in 2008 at over 500 universities, Government labs, and other research institutions in all 50 states**



Source: NNCO





# National Nanotechnology Initiative Infrastructure – User Facilities

## DOE Nanoscale Science Research Centers

**Molecular Foundry**  
Lawrence Berkeley National  
Laboratory



**Center for Nanoscale Materials**  
Argonne National Laboratory



**Center for Functional  
Nanomaterials**  
Brookhaven National  
Laboratory



**Center for Integrated Nanotechnologies**  
Los Alamos National Laboratory &  
Sandia National Laboratory

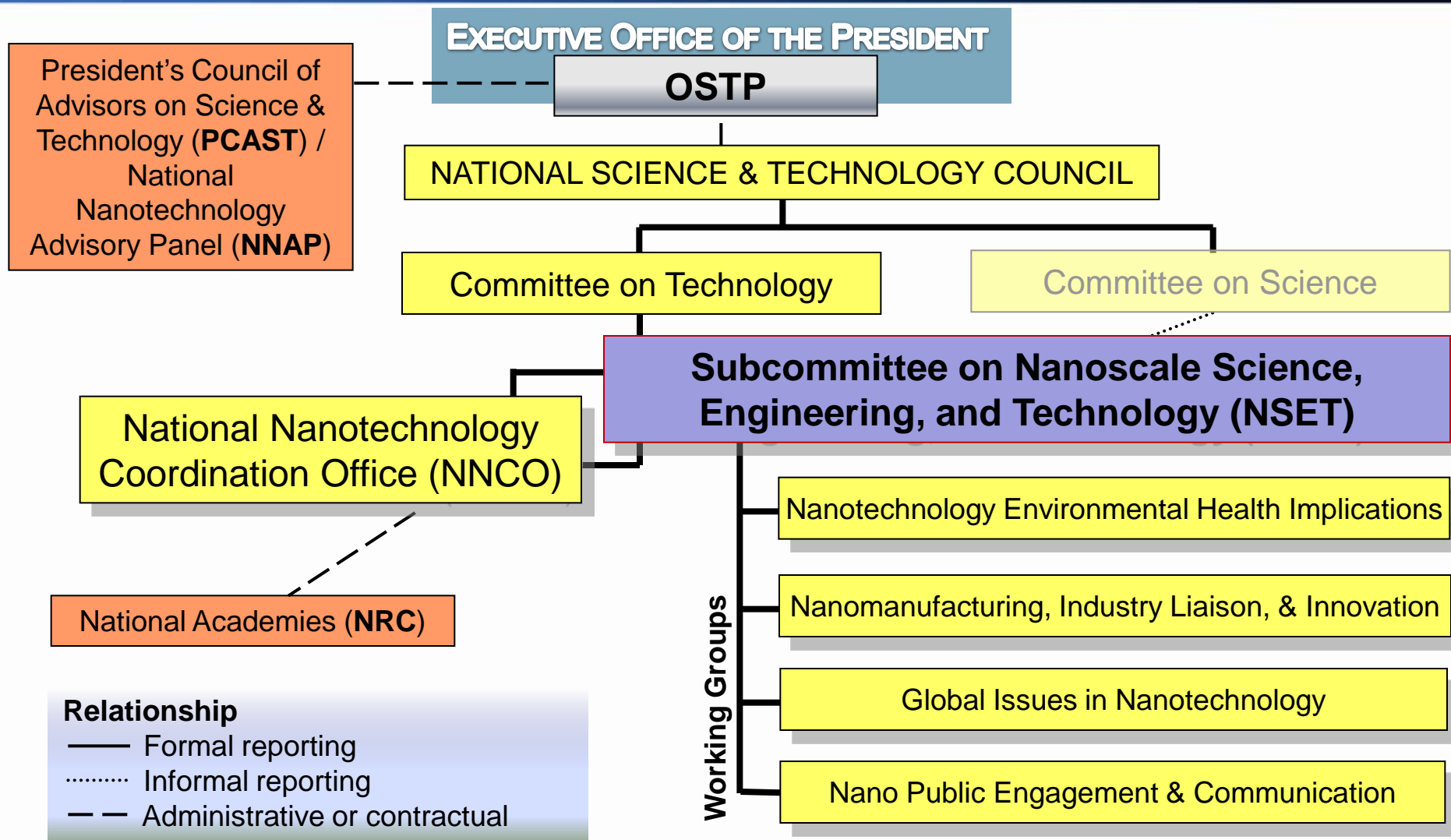


**Center for Nanophase  
Materials Sciences**  
Oak Ridge National Laboratory





# National Nanotechnology Initiative Management and Oversight





# National Nanotechnology Initiative Innovation Catalysis to Date

- Total investment of over **\$12 billion** since FY 2001
- Advanced foundational knowledge for control of matter at the nanoscale with over **4500 research projects in all 50 states**
- Developed an **extensive infrastructure of interdisciplinary research centers, networks and user facilities** distributed across the country
- Invested significantly in **targeted nanotechnology-related EHS R&D** integrated with applications (FY2011 req. \$117m)
- Established major networks for developing public awareness of nanotechnology and formal educational programs
- Organized and conducted 20 major workshops on cross-cutting areas of nanotechnology applications





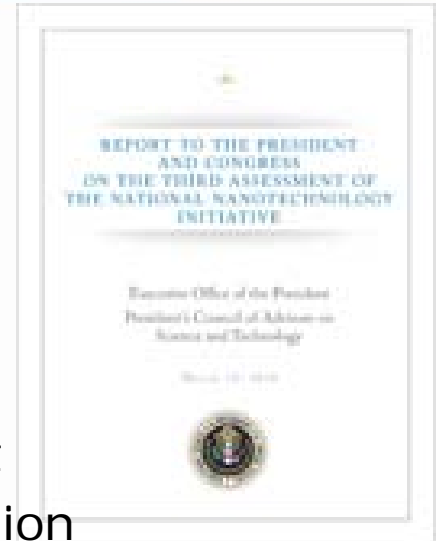
# National Nanotechnology Initiative President's Council Review

- **Key finding**

- US is world leader in nanotechnology R&D and commercialization... but its lead may be transient

- **Key recommendations**

- Increase funding for nanomanufacturing research while maintaining basic R&D support
- Strengthen and expand interagency coordination along the lines of the *Nanotechnology Signature Initiatives*
- Strengthen the National Nanotechnology Coordination Office
- Develop a cross-agency strategy that links environment, health, and safety research with knowledge gaps and decision-making needs
- Develop and implement strategies to retain a greater proportion of U.S.-trained foreign national nanotech PhDs





# National Nanotechnology Initiative Priorities – *Critical Bridges*

- **Maintain and strengthen** fundamental research support and unparalleled NNI infrastructure – *bridge disciplines and communities*
- **Catalyze collaboration to accelerate innovation/commercialization**
  - *Bridge agencies and sectors*
    - **NNI Signature Initiatives**
    - **Public-private partnerships (e.g., Nanoelectronics Research Initiative)**
  - *Bridge internationally*
    - **OECD working parties on nanotechnology and manufactured nanomaterials**
    - **Standards development**
- **Revise and implement** strategy – *bridge knowledge, development gaps*
  - NNI
  - nanotechnology-related EHS research
- **Improve/expand communication and public engagement** – *bridge to stakeholders*
  - [www.nano.gov](http://www.nano.gov)
  - Workshops
  - NNI Strategy Portal – [strategy.nano.gov](http://strategy.nano.gov)



National Nanotechnology Initiative at Ten:  
**NANOTECHNOLOGY**  
**INNOVATION** SUMMIT

**DECEMBER 8-10, 2010**  
GAYLORD CONVENTION CENTER  
WASHINGTON, DC





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