



U.S. Nanotechnology Activities, and Issues in Assessing Economic Impact

Dr. Altaf H. Carim

Assistant Director for Nanotechnology
Office of Science and Technology Policy
Executive Office of the President

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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:

- Coordination across 26 organizations within the Federal government (departments, agencies, etc.)
- 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 or central management



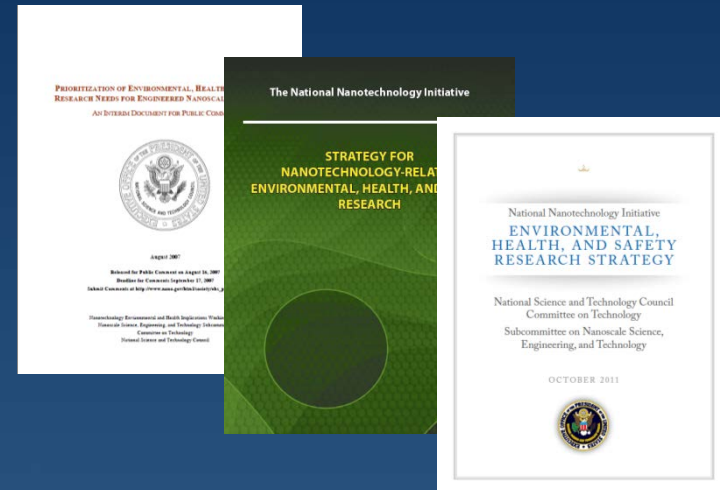
The U.S. NNI Definition of “Nanotechnology”

- 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.
- More than 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)
- 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)
- ISO and other bodies have adopted generally similar definitions (though some regulatory bodies may require more specificity to meet their missions)

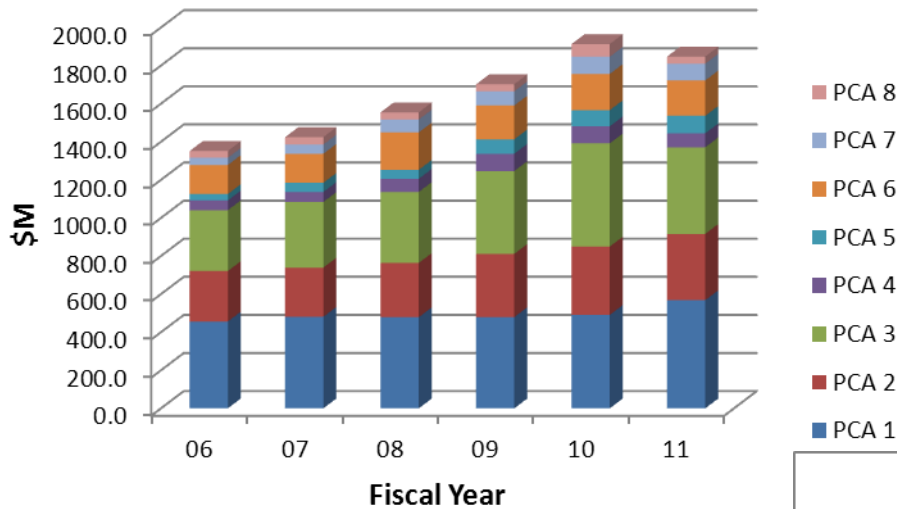


NNI Guiding Documents

- Strategic Plans – 2004, 2007, 2011, ...
- Environmental, Health, and Safety research needs and strategies – 2007, 2008, 2011, ...
- External reviews – National Research Council, President's Council of Advisors on Science and Technology
- Budget Request Supplements – serve as annual reports on NNI
- Workshop reports, policy memoranda, etc.

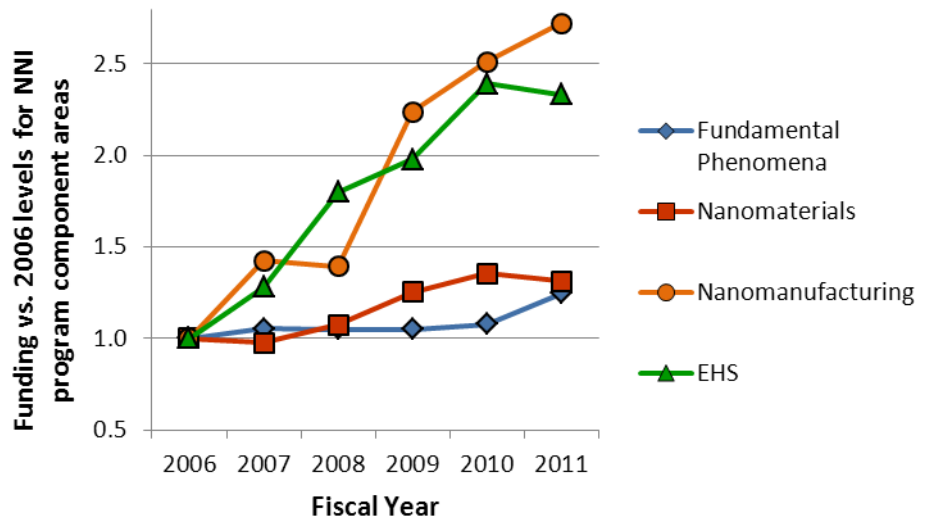


NNI Investments and their Evolution



- 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

- Funding for more fundamental work maintained; large percentage increases for nanomanufacturing and for environment, health, and safety



Methodologies for Assessing Economic Impact

- Consumer valuation
 - What will the market bear?
- Rate-of-return studies
 - Data-intensive analyses, relying on input/output models
- Trace studies
 - Retrospective case studies of innovations and contributions to them
- Innovation indicators
 - Systematic and automated data collection and correlations
- Expert review
 - Based on experience and armed with supporting data

Value of assessment depends on quality and quantity of data, quality of analysis, and suitability of both to purpose



A very incomplete list of challenges, issues, and complicating factors

- Not a single industry – an enabling technology for many industries, encompassing both processes and end products
- Variability in describing products and processes as involving nanotechnology – ranging from reluctance (e.g., as a result of EHS concerns) to hype or unrelated application of the term (iPod Nano, Magic Nano)
- What part of an end product's value can/should be attributed to nanotechnology?
- In many areas contributions to economic impacts from nanotechnology may be hard to separate from other factors
- Economic impacts may occur distant from the source of the underlying investments
- Lag times and difficulty of correlating from inputs to outputs to outcomes (impacts)
- What can be readily measured may not address what we want to know



Key Questions

- **What...**
... are we interested in assessing?
- **How...**
... are we going to measure it?
- **Why...**
... do we want to know? (audience and purpose)
- **When...**
... do we need to collect assessment data, and how often? (longitudinal tracking, trailing vs. leading indicators)
- **Where...**
... do the data come from? (quality, consistency – automated approaches)
- **Who...**
... is responsible for data collection? integrity? analysis? storage? (burden!)





Nano.gov

National Nanotechnology Initiative

*Leading to a revolution in technology
and industry that benefits society*

Nanotechnology
101

Nanotechnology
and You

About the
NNI

Collaborations
and Funding

Publications
and Resources

Education Newsroom Events

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 >>](#)

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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](#)

[Visit the NNI Budget Dashboard >>](#)



Regional, State,
and Local
Initiatives in
Nanotechnology
Workshop (RSL
2012)

Limited travel support
is now available for

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

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