NANOMANUFACTURING, INDUSTRY LIAISON, AND INDUSTRIAL INNOVATION Working Group (NILI)

Nanoscale Science, Engineering and Technology Subcommittee (NSET/NSTC) Meeting
October 13, 2009

M. C. Roco, NSF
NILI Chair

NILI Timeline

- 2003 – Collaborative Board for Advancing Nanotechnology (CBAN) with electronic industry signed

  2003 -Regional, State, and Local Initiatives in Nanotechnology

  2004 - activities with chemical industry (CCR), bio-technology industry (BIO) and organization and business (IRI)

- April 2004 – proposed Nanotechnology Industry Liaison with Industry (NILI) WG and Nanomanufacturing WG

  "NILI Terms of Reference" (version 1) - April 2005

  "NILI Charter" (version 2) - July 2008
  Nanomanufacturing replaces Nanotechnology in the title

Nanomanufacturing, Industry Liaison, and Innovation (NILI) Working Group

- **Purpose**: to advance and accelerate the creation of new products and manufacturing processes derived from discovery at the nanoscale.
- **Goals:**

  1. Facilitate nanotechnology innovation, nanomanufacturing advancement, and technology transfer in and by Federal agencies

  2. Exchange information and stimulate interactions relating to nanotechnology among Federal agencies, academe, industry, professional societies, and State and local organizations

  3. Create innovative methods for transferring techn. to industry

1. What mechanisms or programs federal agencies offer to facilitate innovation and advance nanomanufacturing?

A. Create foundation

- Support R&D to create the technology base
  - Ex: Nanomanufacturing programs at NSF, NIST and DOD; MARCO net
- Infrastructure for instrumentation, tools, labs
  - Ex.: 5 DOE labs; NSF's NNIN, NCN, other 70 centers and networks; NCI; NIST metrology and standards; NSF instrumentation program
- Support research and regulatory system for nano-EHS
  - Ex: EPA, NIEHS research, 3 NSF centers (2CEINs, CBEN), FDA
- Prepare the workforce at all levels, and public
  - Ex: NCLT; NISE; Technological, Community Colleges and in PA

1. What mechanisms or programs federal agencies offer to facilitate innovation and advance nanomanufacturing?

B. Interactions with industry and states

- Various mechanisms for interaction with industry
  - Fund collaborations with industrial partners
    - Funding programs (examples): SBIR/STTR (six agencies), CRADA (DOE), TIP (NIST), GOALI and IUCRC (NSF), Industry-led NRI (NSF and NIST),
    - Provide user facilities, nano-informatics, patent framework: NNIN, NCN (NSF), NSRC (DOE), CNST (NIST), ISN (DOD), NCL (NIH)
  - Support partnerships with industry groups
    - Communicate the NNI results to industry: Industry liaison groups with the electronics, organization and business, forest products, and chemical industries; "NanoHealth Enterprise"
  - Regulatory activities by EPA, FDA, HHR, NRA, USPTO

NNI Translational Funding

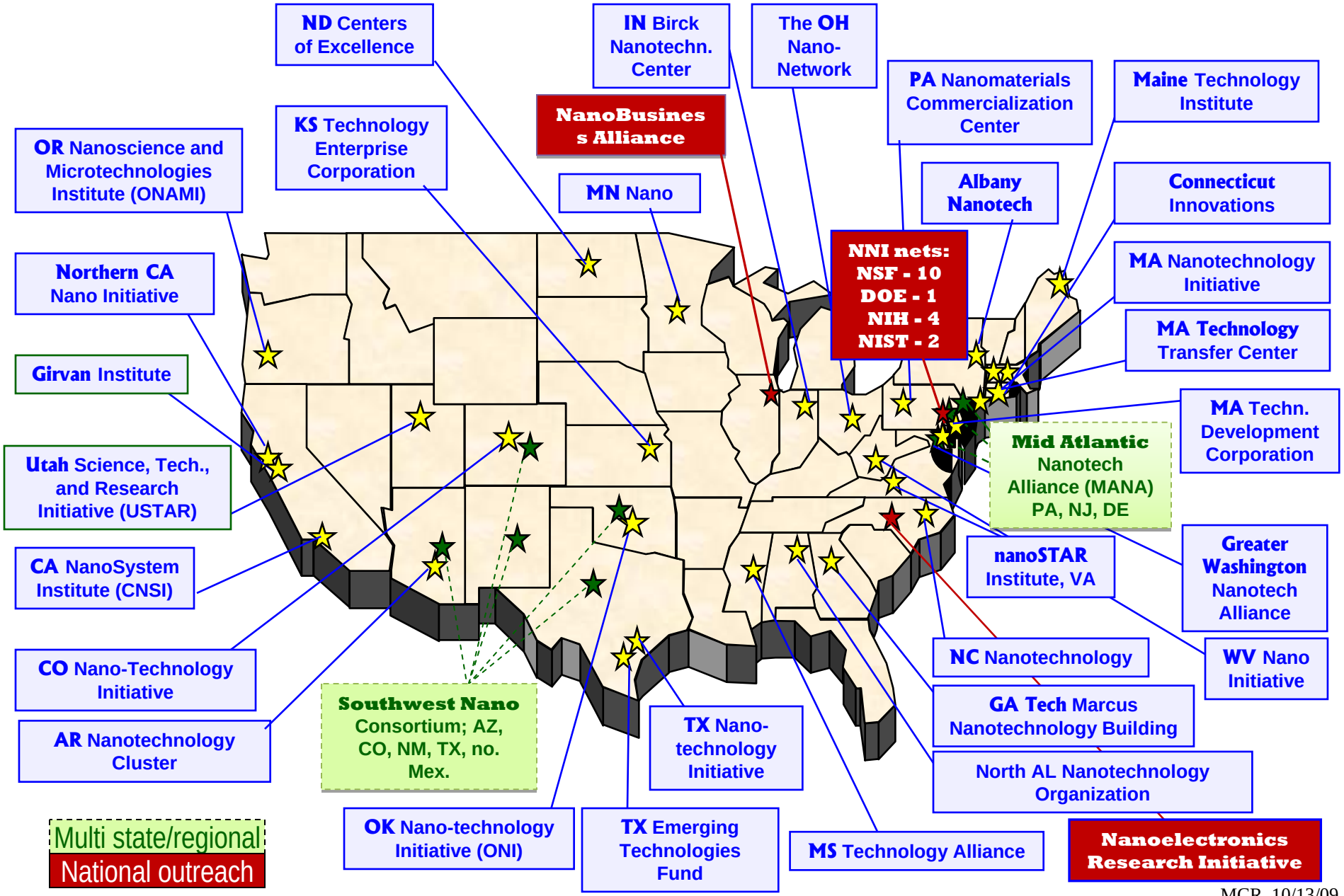
2. What mechanisms or programs federal agencies offer to exchange information related to NT with industry, state and local organizations?

Illustrations:

- Website with NSF projects with abstracts, funding level and contacts at www.nsf.gov/nano (first item)
- NCI Alliance for NT in Cancer site http://nano.cancer.gov
- EPA has research, voluntary programs and regulatory on nanotechnology
- FDA has a special focus on nanotechnology products
- The Consumer Product Safety Commission (CPSC) is a regulatory agency http://www.cpsc.gov/library/cpscnanostatement.pdf).
- OECD Project on Nanotechnology Impacts on Companies and Business Environments, *and Project on Nanotechnology Indicators and Statistics*, http://www.oecd.org/sti/nano
- USDA, Nanoscale Science and Engineering for Agriculture and Food Systems – National Planning Workshop, http://www.nseafs.cornell.edu/

2009 Nanotechnology Regional, State, and Local Initiatives (34)

http://www.nano.gov/html/funding/businessops.html#RSLI



3. What mechanisms or methods federal agencies offer to enable transfer of technology to industry?

Illustrations:

- SIA-SRC-NSF-NIST: Nanoelectronics Research Initiative
- NSF SBIR/STTR matching for phase 2
- NSEC – Nanoscale Science and Engineering Centers
- MRSEC – Materials Research Science & Engineering Centers
- NIH Public-Private-Partnership,
- NIH SBIR phase 2 Competing Renewals; Technical Assistance Program (TAP); Pipeline to Partnerships (P2P)
- *NIOSH Nanotechnology Field Team (NIOSH Publication No. 2008-121: NIOSH Nanotechnology Field Research Effort;*
- USDA, *Competitive grants, including SBIR, formula funds, and Congressional earmarks for research, education and extension activities*

SBIR – STTR Programs

- DOD, NSF, NIH, DOE and NASA support both SBIR and STTR
- EPA, NIOSH, NIST, and USDA have SBIR
- Total FY 2007 nanotechnology SBIR funding for : $71.3 million
- Total FY 2007 nanotechnology STTR funding: 11.4 million

NNI-Industry Consultative Boards for Advancing Nanotech

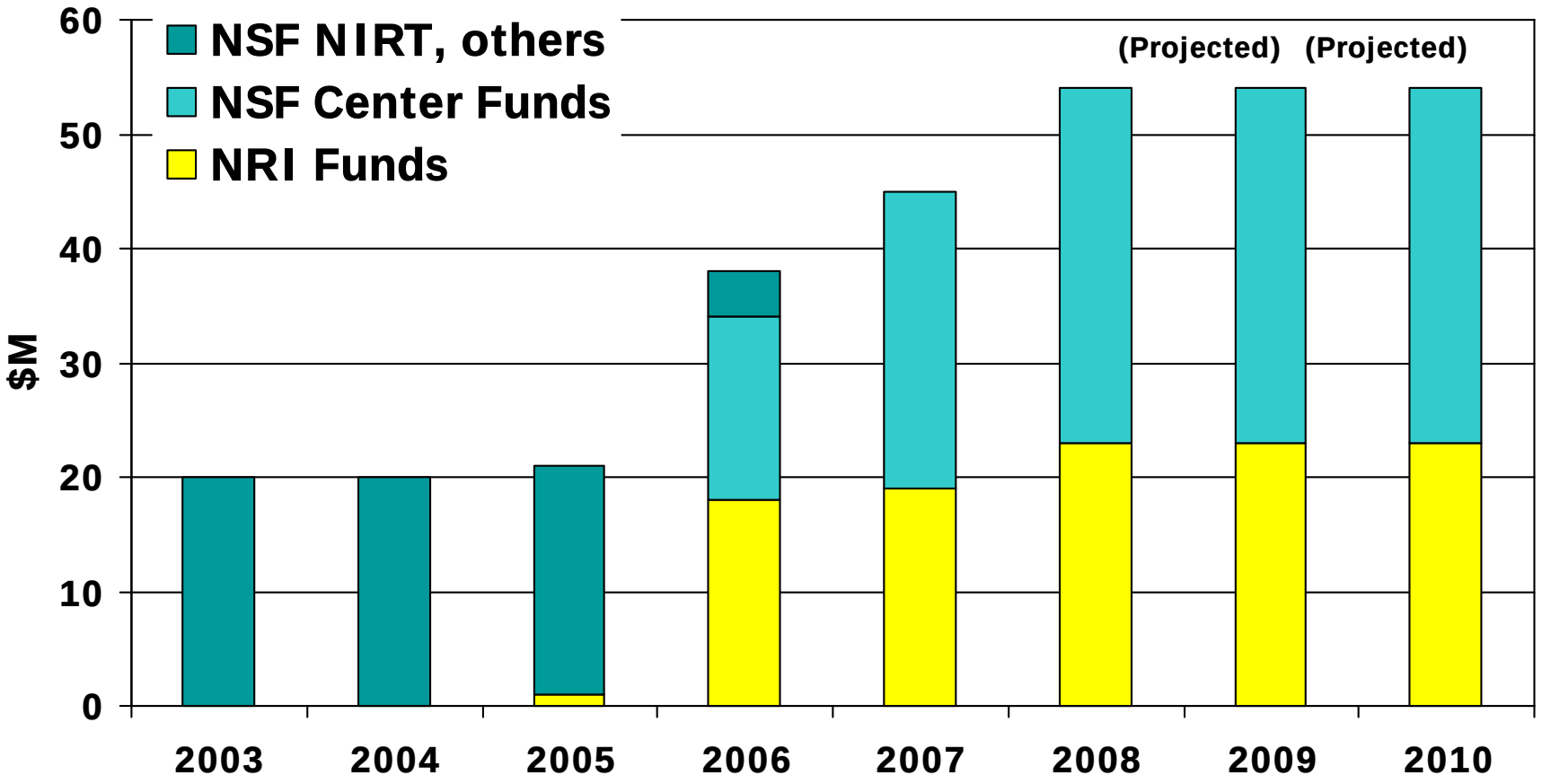
- **NNI-Electronic Industry (SRC lead), 10/2003 -**
  - Collaborative activities in key R&D areas
  - 5 working groups, Periodical joint actions and reports
  - NSF-SRC agreement for joint funding; other joint funding

- **NNI-Chemical Industry (CCR lead)**
  - **Joint road map for nanomaterials R&D; Report in 2004**
  - **2 working groups, including on EHS**
  - **Use of NNI R&D results, and identify R&D opportunities**

- **NNI – Organizations and business (IRI lead)**
  - **Joint activities in R&D technology management**
  - **2 working groups (nanotech in industry, EHS)**
  - **Exchange information, use NNI results, support new topics**

- **NNI – Forestry and paper products (AF&PA lead, 4/2007), 10/2004-** **Workshop / roadmap for R&D**
  - **Exchange information**

Estimation of NSF-NRI Research Funding



NRI – Nanoelectronics Research Initiative

National Nanomanufacturing Network (NNN)

- 4 NSECs; focus systematic interaction with industry

  - Center for Scalable and Integrated Nanomanufacturing, UCLA (2004-)

  - Nanoscale Chemical-Electrical-Mechanical Manufacturing Systems, University of Illinois at Urbana-Champaign (2005-)

  - Center for High Rate Nanomanufacturing, Northeastern University (2005-)

  - Network for Hierarchical Manufacturing U. Mass. - Amherst (2006-) *(Main Node of NNN)*

- DOD; DOE; NIST (Laboratory for Nanoscale Science and Technology); NIH; NIOSH

NanoFab,
part of NIST's Center for Nanoscale Science and Technology

- State-of-the-art equipment and expert training available.
- The CNST NanoFab has supported advanced research projects in polymers, biology, nanoelectromechanical systems, ceramics, radiation physics, atomic physics, optics, and more.
- It also provides access to a wide variety of measurement and characterization tools and technologies

http://cnst.nist.gov/nanofab/extUser.html

DOD/ Air Force

www.afrl.af.mil/techtran_index.asp

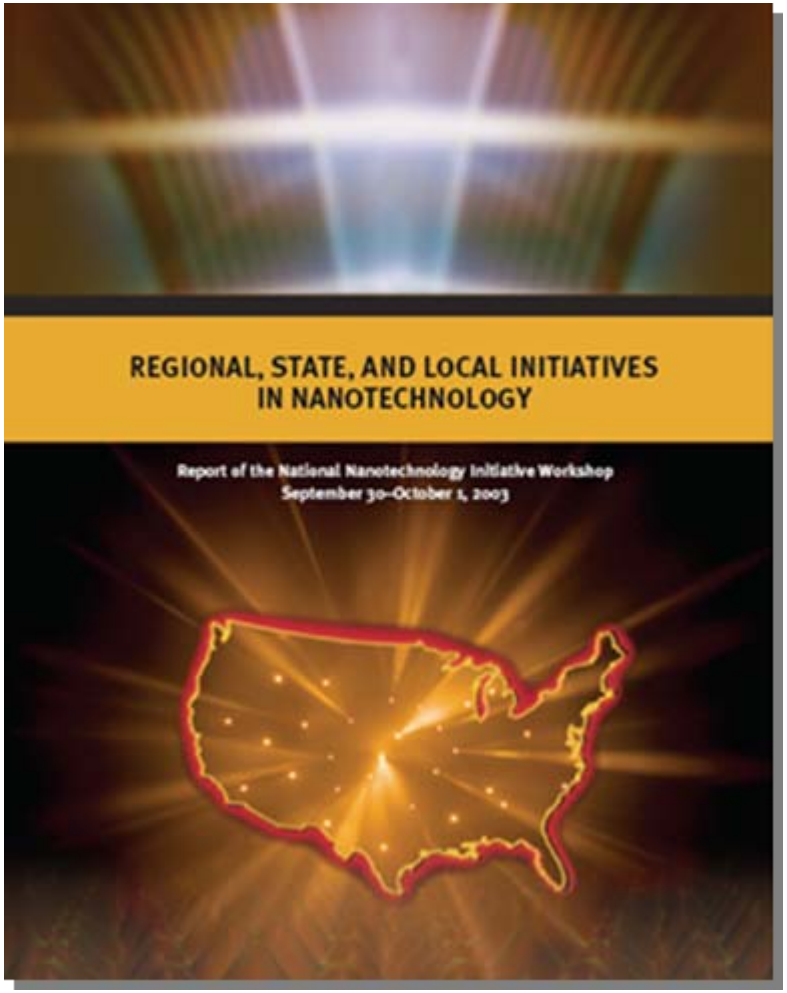
Illustrations

- Technology Transfer Program (T2), ex. Research Laboratory
- Technology Transfer Cooperative Research and Development Agreements (CRADAs)
- Technology Transfer Education Partnership Agreements (EPAs)
- Technology Transfer Patent License Agreements (PLAs)
- Technology Transfer Commercial Test Agreements (CTAs)
- Office of Techn. Transition Partnership Intermediary Network, DOS
  - TechLink www.twchlinkcenter.org
  - FirstLink www.DODfirstlink.com
  - SpringBoard www.gospringboard.org
  - DOD TechMatch www.DODtechmamatch
  - T2Bridge www.T2bridge.com
  - MilTech www.miltechcenter.org

Several reports

- 2003 and 2009 Regional State and Local Initiatives workshops and reports
- Workshops on nanomanufacturing
  2004 report
- SBIR/STTR annual reporting to OMB and Congress

Two earlier reports in 2003



Four NILI surveys to be completed and disseminated on the website

1. Regional State and Local Initiatives (RSLI)
2. NNI agencies interactions with industry, states and local organizations
3. Nanomanufacturing activities at NNI agencies
4. Small Business Innovation Research (SBIR) and Small Technology Transfer Research (STTR) investments across NNI

Next steps

- Complete the 2009 RSLI workshop report
- Complete the four NILI surveys on current state
- Increase participation of groups and agencies involved in nanomanufacturing, partnering with industry, and technology transfer
- Disseminate use of NNI infrastructure
- Evaluate new environment for innovation in the U.S.
- Create a NILI webpage on www.nano.gov to include all relevant activities

Acknowledgements

Thanks for participation and support from member agencies and NNCO