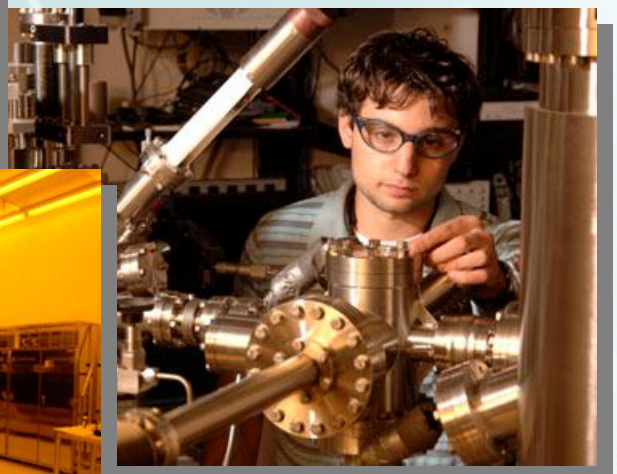
New York's Nano Initiative

Dr. Pradeep Haldar

Professor and Head, NanoEngineering Constellation

Director, E2TAC

Executive Director, New Energy New York



E2TAC™

College of Nanoscale Science & Engineering

University at Albany State University of New York

The World of Nanotechnology

An Initiative With State Wide Economic Implications

E2TAC™

New York's Leadership in Nanotechnology

- Nanotechnology is backbone of the global high tech economy of 21st century.
- New York has developed an integrated R&D, education and business strategy to attract and retain the nanotechnology industry.
- The core strategy is the Governor's Center of Excellence at Albany.
- "Create a powerhouse of intellectual assets and cutting edge infrastructure to provide nantechnology industry with key enabling innovations."

NY Governor

"New York Jumps 3 Slots to 4th on Small Times Magazine's list of Tech Hot Spots" 2004

Infrastructure: Shared-Use, Co-Location Model

- 800,000 sq. ft. in facilities, including 80,000 sq. ft. of 300mm wafer cleanrooms
- Partners include SEMATECH, IBM, AMD, Micron, Infineon, Tokyo Electron, and ASML, among others
- Over $4.5B in assets, in addition to the buildings themselves
- Over 2,200 employees within the complex

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Timeline: 1993-2005

10/93 — Center for Advanced Technology (~$10M)

08/98 — National Focus Center Consortium ($10M/year)

06/97 — NanoFab 200 Building ($16.5M)

04/01 — Nanoelectronics Center of Excellence ($150M)

07/02 — International SEMATECH North ($320M/ 5 years)

11/02 — TEL R&D Center ($300M/7years)

04/03 — NanoFab 300S ($50M)

01/05 — ASML R&D Center ($400M/5 years)

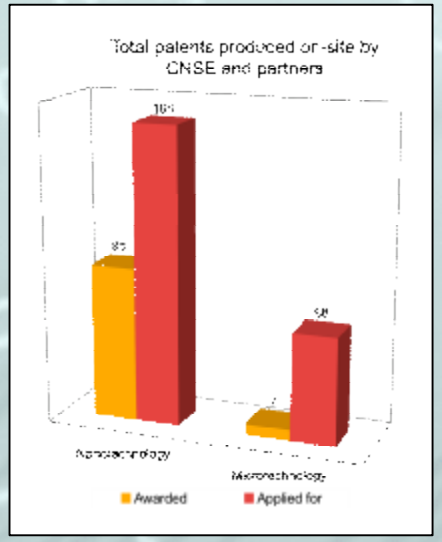
04/04 — College for Nanoscale Science & Engineering

01/05 — IBM-Albany CSR ($450M)

The College of Nanoscale Science & Engineering

- **Faculty: 48**
- **Total enrollment: 150 graduate students**

Ranked #1 college in the world for nanotechnology in 2007 by Small Times Magazine

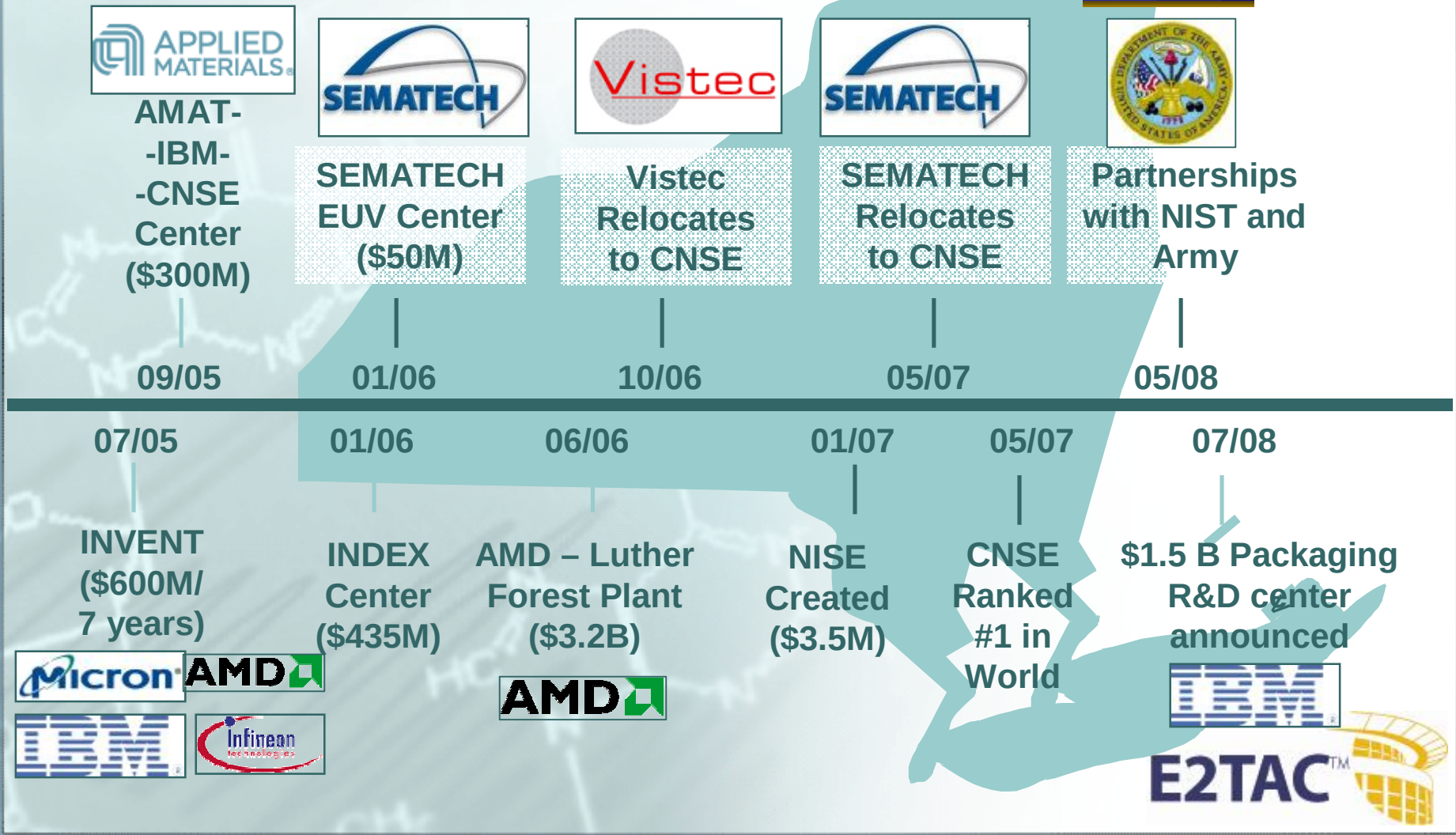


Established in 2004

- NanoScience
- NanoEngineering
- NanoBioscience
- NanoEconomics

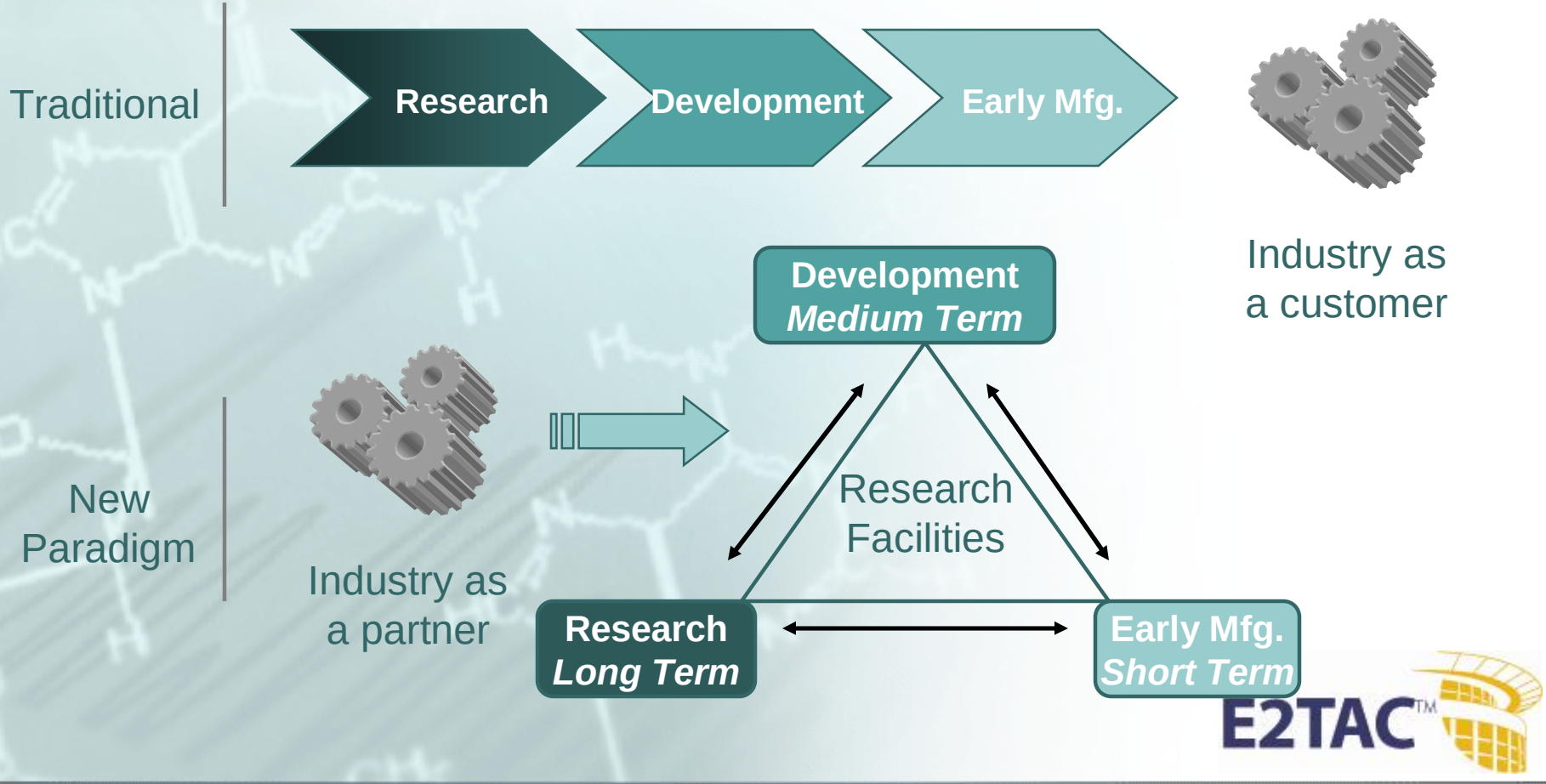
COLLEGE OF NANOSCALE SCIENCE & ENGINEERING
UNIVERSITY AT ALBANY State University of New York

Timeline: 2005-Present



New Research/Business Model at CNSE

- Practicing a new paradigm for university, industry, and government collaboration



An Integrated Strategy for Success

Four Key Factors

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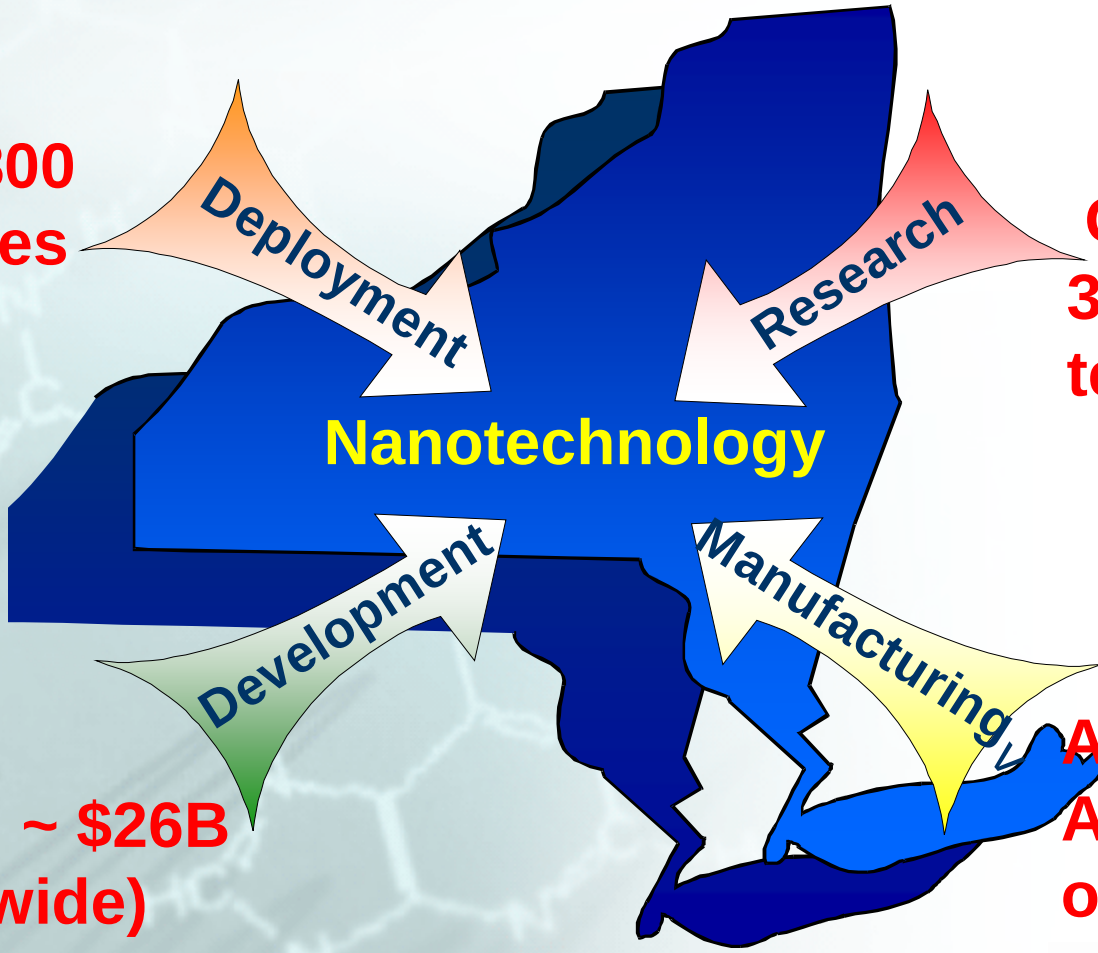
A State Wide Industry, Extending from Albany to Buffalo and NYC to North Country and Long Island

More than 800
NY companies



Over
364,000 high
tech jobs

Total payroll ~ $26B
(3rd Nationwide)

Average
Annual Wage
over $75K

Sources: ESDC, SIA, AeA.

E2TAC™

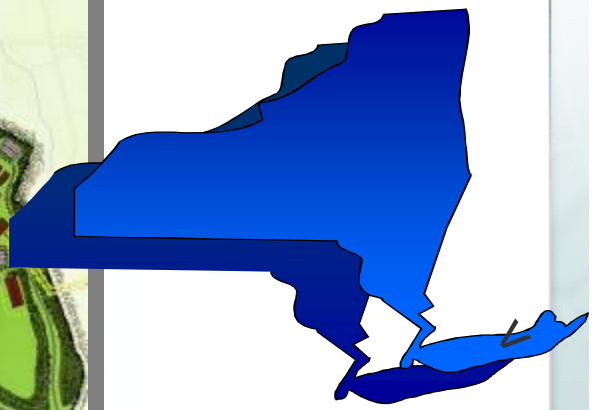
AMD* Announces New Fab in Saratoga, NY

Luther Forest Technology Campus – Saratoga, NY

- **1,350 acres (over 2 square miles or 546 hectacres)**
- **Pre-permitted for nanotechnology manufacturing and R&D**
- **Up to four fabrication facilities can be constructed for a total of two million square feet including 250,000 square feet of clean room space per fab.**

- **AMD will build $4.2 B, 300 mm manufacturing facility at the 32 nm node –in 2010**

- **Need for up to 6,000 highly skilled workers**



*Global Foundaries

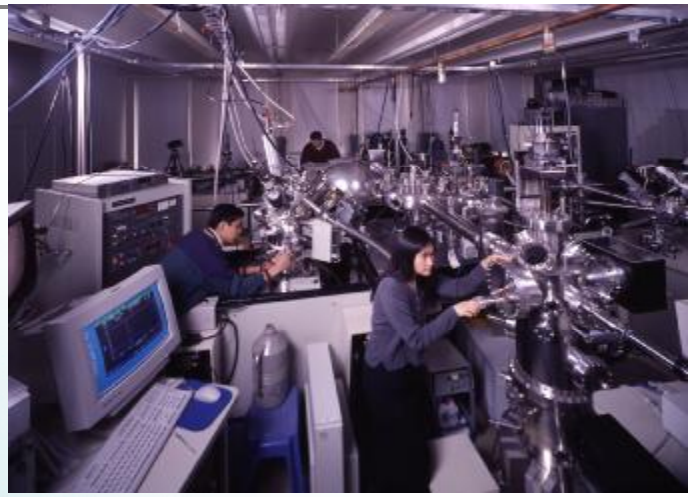
Key Drivers

- **Center of Excellence in Nanoelectronics (ANT):**
  Global resource for nanotechnology academic-industrial R&D partnerships.
- **College of Nanoscale Science and Engineering:**
  First college in the world dedicated to the educating the workforce of the 21st century.

E2TAC™

Vision and Mission

Vision. Leverage state-of-the-art resources to establish effective partnership with industry, government and university that will enable realization of technology roadmaps and pioneering nanoscale research.



Mission. Create a financially and technically competitive environment with nanotechnology innovations and research advantages through vertically integrated partnerships.

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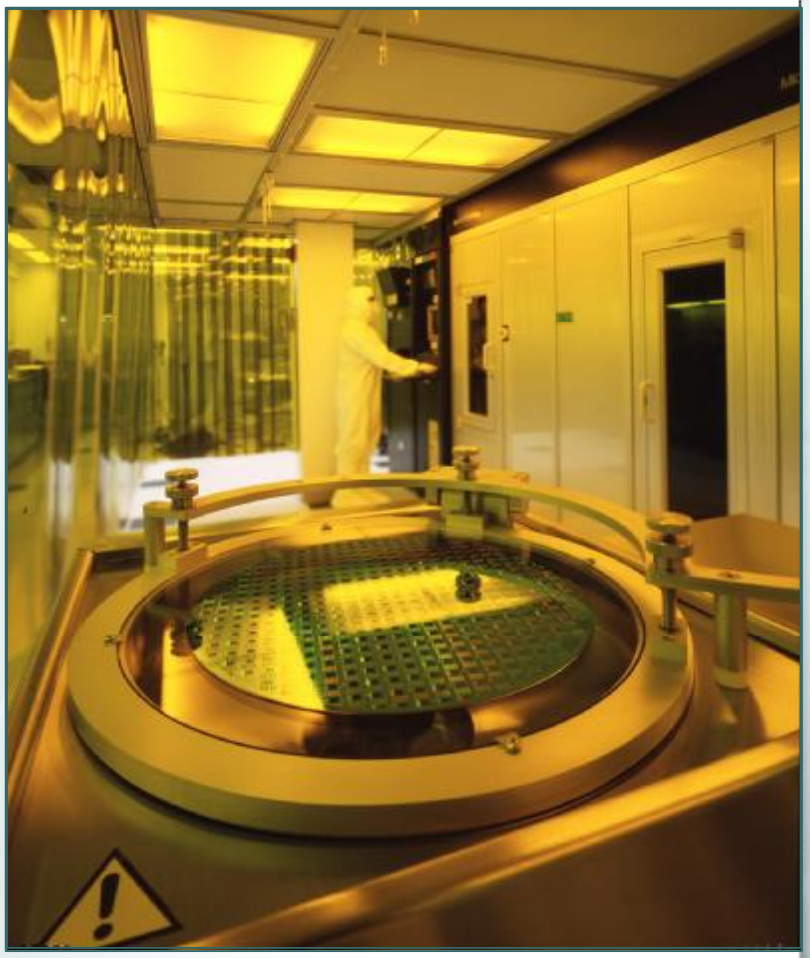
Overall Operating Model

- CNSE provides facilities, equipment, tooling, clean rooms
- Operates as separate independent unit from University
- Performs basic and applied research in nanoelectronics and nanotechnology areas in partnership with industry
- Leverages matching funds from CNSE, New York State, Federal govt and industrial partners
- Has long term relationship with industrial consortia
- Operates under sole-source, multi-task delivery contracts to perform work in collaboration with industry



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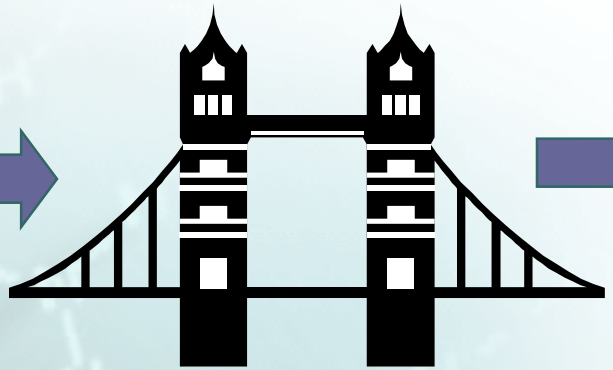
Filling the Need:
Creating a Technology Acceleration Bridge

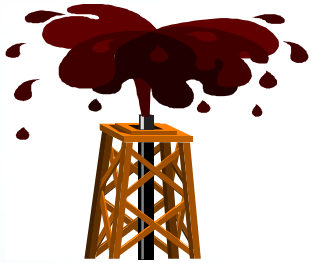
New technology applications

University

TCs



Tech Grand Challenges: "A Technology Acceleration Bridge"



Technology Incubation

Pilot Prototyping

Test-bed Integration

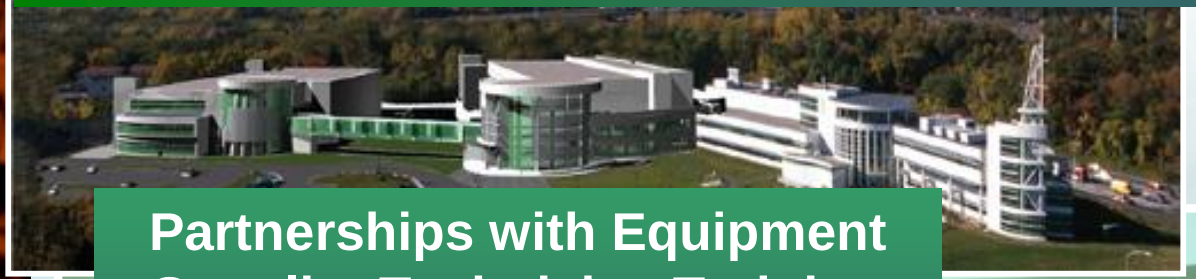
Technology Roadmaps → Outreach Strategies → Commercial Pathways → Targeted Deployment

L2TAC™

Workforce Development

World's First College of Nanoscale Science & Engineering offering (Ph.D & M.S. degrees)

M&W Zander
Center for Construction Trades Training
(Skilled Trade Classifications)



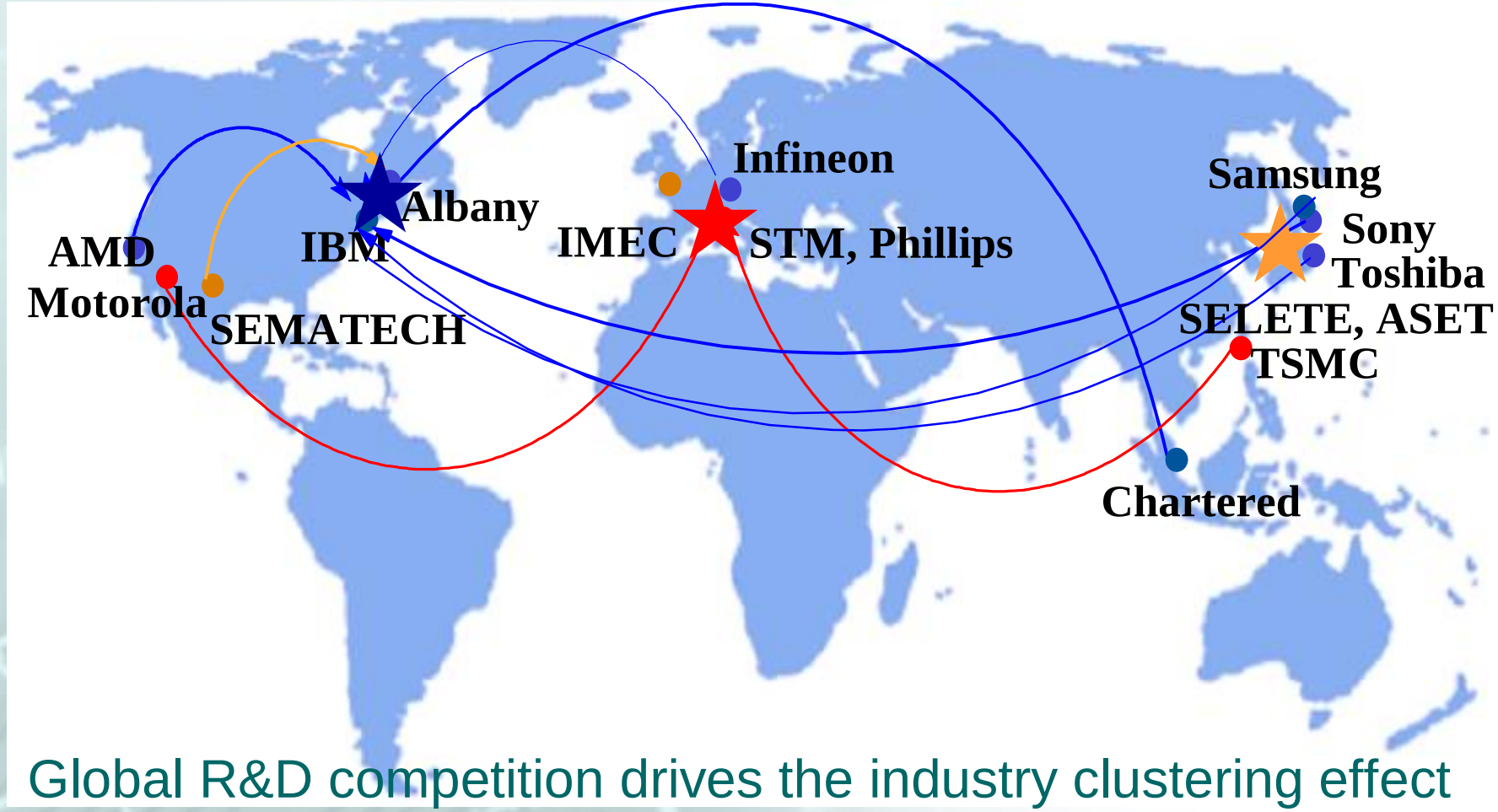
Partnerships with Equipment Supplier Technician Training Programs (Certificate)

Partnerships with Community College SMT Operator Programs (AAS degree)

High School & Undergradueate Internships

SEMI® Workforce Development Institute

Global Gateway for Industry Clustering



Global R&D competition drives the industry clustering effect

$8.0 billion invested & 2500 jobs since 2002 in Tech Valley

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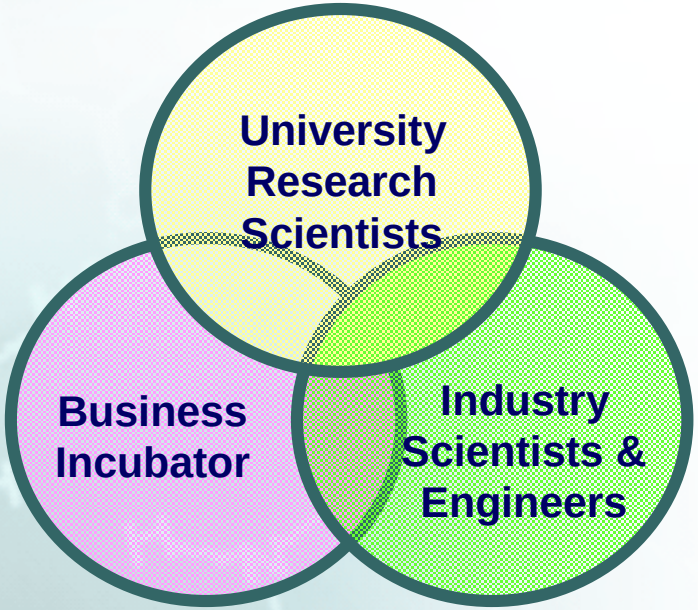
CNSE's Successful Co-Location Model



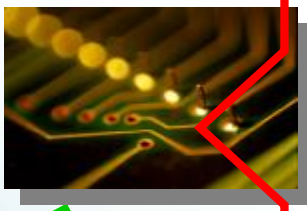
Applications of NanoTechnology

Pervasive Tether-free Computing

Wireless Data

Cellular

Communications



Energy

Automotive

NanoTech Innovations

Defense

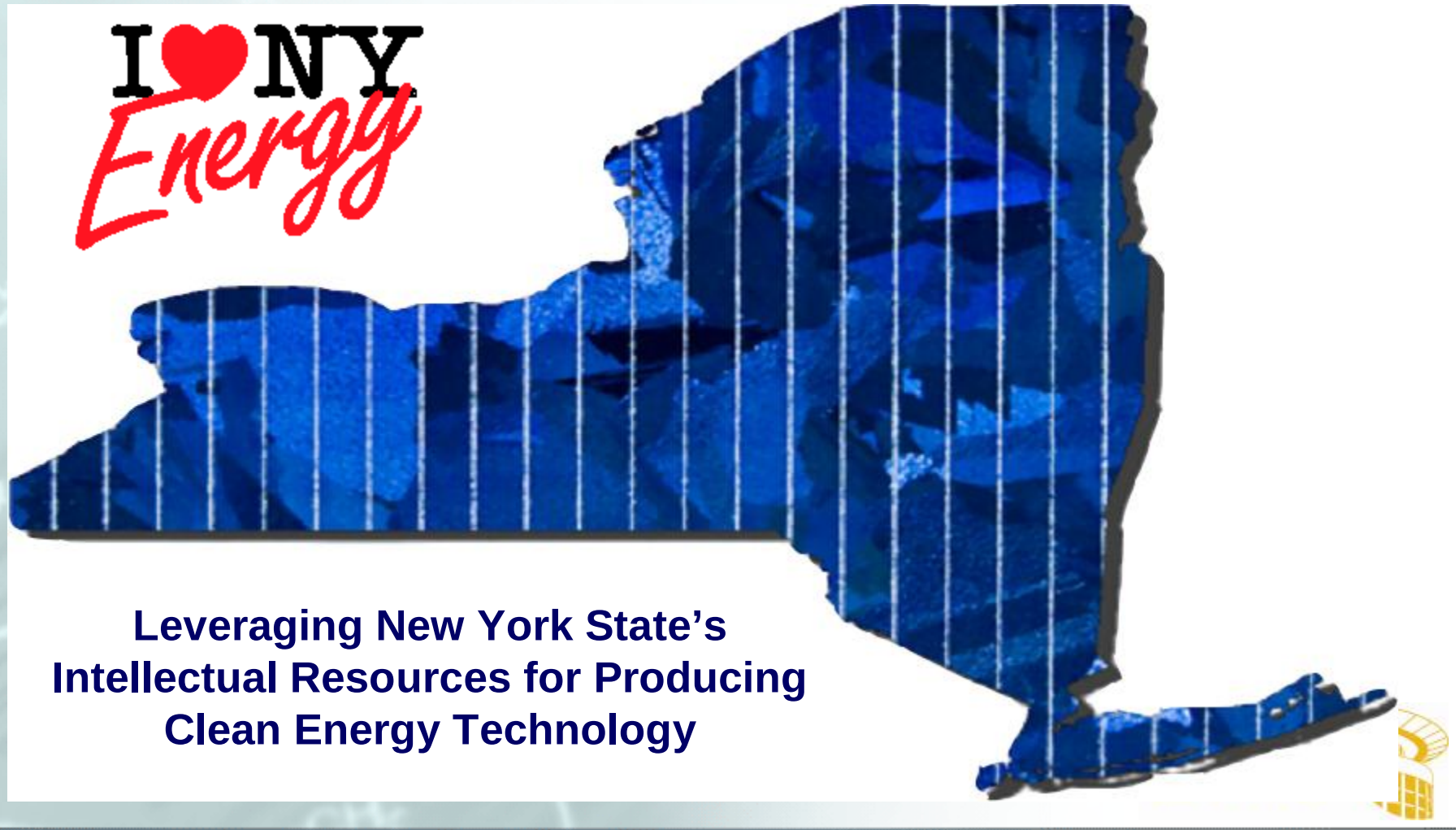
Biohealth

Sensors

Aerospace

New York's Energy Technology Clusters

Creating Green Jobs



Leveraging New York State's Intellectual Resources for Producing Clean Energy Technology

NYS Deployment Incentives: Successful Programs

- SBC Funded Programs
  - Promoting energy efficiency and demand management
  - Facilitating renewable energy development
  - Providing energy services to low income New Yorkers, and
  - Conducting research and development on renewable technologies
- Renewable Portfolio Standard (RPS) – 45% by 2015
  - Customer sited tier program
  - Main tier program
- Regional Greenhouse Gas Initiative (RGGI)
  - A regional cap-and-trade program
- Executive Order 2
- NYSERDA - $700 M budget

RGGI

NYSERDA

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Technology Push:
R&D Incentives and Clusters

"In order for the State to gain the full economic benefits of renewable energy, New York will encourage in-state development and production of renewable energy equipment."

Attract, grow and retain high tech companies and jobs

Enable drawing in of substantial private investment in NYS

E2TAC™

New York's ENERGY TECHNOLOGY CLUSTERS

Biomass
Alternate fuel: Biomass
Biomass feedstocks
Biomass combined heat and power
Biogas logistics/economics
Biowaste
Gasification

Renewable Energy Generation and Storage
Solar Photovoltaics
Wind Energy
Fuel Cells, PEM and SOFC.
Hydrogen Generation
Hydrogen Storage

Transportation
Alternative fuel: hydrogen

Environmental Systems
Building Envelope
Space heating and cooling
Lighting
Building Codes and Standards
Building Management Systems
Solar Thermal

Policy and Financing
Renewable energy policy
Capitalization and financing

Fundamental Renewable Research
Material Science
Fuel Cells

Thank you !

Questions?