

NATIONAL INSTITUTE FOR NANO-ENGINEERING (NINE)
MEMORANDUM OF UNDERSTANDING

Background: A number of high-level national reports have called the future of America's *Innovation Engine* into question. Effectively answering the challenges that have been articulated will require 1) new approaches to engineering education to improve the pipeline for technical talent and 2) new collaborative relationships across R&D sectors to enhance our ability to capitalize on scientific discoveries. The 'American Competitiveness Initiative' and associated congressional legislation has provided a blueprint for a bold national vision. A key element of this vision is the establishment of national innovation hubs, called Discovery Science and Engineering Innovation Institutes (DSEII), as centers of excellence for the promotion of science and engineering education, R&D collaboration and American competitiveness. The National Institute for Nano-Engineering (NINE) will be a national innovation hub chartered to develop a new generation of innovators and innovations through a unique, multidisciplinary education and research partnership that brings together government, academia and industry. This institute will embody a central facility at Sandia National Laboratories (Albuquerque, NM) and partner sites at key universities and industries across the U.S.

Purpose: This Memorandum of Understanding (MOU) is a non-binding document setting forth the signing parties' intent to work together to establish the NINE as a national Discovery Science and Engineering Innovation Institute. This MOU defines the goals of NINE, its operating principles and the roles of the partners. By signing this MOU, the partners indicate their intent to be part of a proposal to the Department of Energy (DOE) for NINE and to provide information for the proposal and advocacy for NINE. The partners also agree to explore areas of research collaboration to initiate projects that will become part of NINE upon its establishment. Charter partner institutions are listed in the Appendix. The formal establishment of NINE will be based upon other written agreements which will be the subject of subsequent negotiations. This MOU is not a definitive agreement and is not intended to give rise to, nor does it create, any legally binding obligation on any signing party.

Goals: NINE will be based on a hub and spoke model with a central facility (hub) at Sandia National Laboratories (Albuquerque, NM) and gateway (spoke) sites at partner universities and industrial labs. The goals for NINE are:

- Transform engineering education, curriculum, and team teaching approaches in the interdisciplinary field of nano-engineering to provide the desired depth and breadth.
- Develop a new generation of nano-engineers skilled in working across multiple disciplines and institutions using the latest engineering tools and facilities.
 - Provide broad opportunities for hundreds of graduate and undergraduate students with special recognition for being a NINE graduate.
- Drive U.S. competitiveness through high-leverage, team research and accelerate experiential learning by having students participate in the entire innovation process.
- Create innovative technical solutions (with focus on pre-competitive research) in nano-engineering to address important national challenges.

- Pilot the government/academic/industrial education and innovation hub model as a novel approach that builds off previous experience and successful partnerships.
- Capitalize on Department of Energy investments in science and technology to drive transformation.

Areas of Collaboration: Nano engineering research and development through multidisciplinary teams with participation from industry, universities, and Sandia. Technical areas of focus for the teams will be identified by partners to create nano engineering approaches and tools. The intent is that NINE will focus on pre-competitive technology. Related protected work can be performed at the partners' home institution. Such research with industrial partners will usually transition into a Cooperative Research and Development Agreement (CRADA) structure to be funded directly by industry.

- Examples of research theme areas include:
 - Nano electronics and computing
 - Nano composite design and manufacturing
 - Nano materials and technologies for energy applications
- New curriculum and novel learning opportunities through a national network include:
 - Nano science and engineering classes and labs connected to theme areas
 - Innovation lecture series
 - Business and leadership classes
- Training and classes for state-of-art tools such as high performance computing, nano integration engineering tools, and MEMS/ μ fabrication.
- National outreach to stimulate interest and engagement in science, technology and engineering with teachers and students (K-12 focus)

NINE will provide a framework and focus to bring various efforts together to increase impact at the national level.

Duration: This MOU will be in effect for two years or until NINE is established as an operating consortia (whichever comes first). Any partner may withdraw from this MOU by providing written notice to the other partners of such withdrawal. Once NINE is established, and agreement is reached on the terms and conditions of such consortia, this MOU of intent will be replaced by a governance agreement.

Funding: This MOU shall not be used to obligate or commit funds or as the basis for the transfer of any funds.

NINE Partner Roles: The partnership among Sandia, industrial and university participants is *the* critical component in achieving the goals of NINE. This section highlights the roles and responsibilities for the partners that will create success. Once established, NINE will have a governance board that oversees operations and a steering committee to assess the program and set future directions. Members of both committees will be elected and rotated in a manner directed by the future governance agreement.

Role of Sandia National Laboratories:

1. Sandia will have responsibility for leading the NINE steering committee composed of industry, university and Sandia representatives.
2. Sandia will develop and manage the necessary infrastructure to provide a productive and creative environment for visiting students, professors and industrial partners. Providing a quality experience for the students will be the top priority for NINE.
3. Sandia will provide committed researchers in nano engineering who will mentor students, lead theme areas and actively participate in the research.
4. Sandia will provide tutorials, and training on state-of-art capabilities, and tools. Access to Sandia facilities will be facilitated by the NINE management team.
5. Sandia will participate in curriculum development (lead by partner universities) and teaching classes, as appropriate. Sandia will provide access to partner curriculum for students at SNL through distance learning.
6. Sandia will coordinate a national K-12 outreach effort in collaboration with ongoing partner activities, as appropriate.

Role of Industrial Partners:

1. Industrial members will participate on the NINE steering committee.
2. Industrial partners will help focus NINE research in a commercially relevant direction. This aspect will be important for NINE to have an impact on competitiveness and engage students in the commercial innovation process. Industrial participation on the NINE steering committee will also ensure that the NINE research activities provide value to the industrial partners.
3. Industry will provide technical expertise in nano-engineering, participate on the research teams and mentor students. Industry partners could host students at their facilities as NINE interns.
4. Industry will provide commercialization expertise to research teams. Curriculum development in the area of IP management, leadership, business acumen, etc. will greatly benefit from industrial perspective.
5. Industrial partners will participate in K-12 outreach activities when appropriate.

Role of University Partners:

1. University members will participate on the NINE steering committee.
2. University partners will lead the curriculum development activities funded through NINE and will teach partner classes as appropriate. University curriculum leaders will coordinate the distance learning activities across the sites.
3. Universities will work to develop special degree or certification programs in nano-engineering that link to NINE.
4. University professors and students (graduate and undergraduate) will participate on the NINE research teams. Students off campus will have an on-site advisor who will work with the Professor to guide the student.
5. University partners will work to facilitate the availability of unique tools (modeling, simulation, and analytic), and capabilities available at the university that will advance the progress of the NINE theme research teams.

6. Students who are not attending a partner university will be able to participate in NINE through a nationally competed NINE fellowship and scholarship program. It is proposed that DOE administer and fund the fellowship and scholarship program.

Partner Institution: _____

Authorized Signature : _____

Typed Name: _____

Title: _____

Date: _____

Other parties can be added to this MOU with the agreement of the participant signatories.

APPENDIX

PARTIES TO THIS AGREEMENT:

- Government
 - Sandia National Laboratories

- Industrial Partners
 - Intel
 - Goodyear Tire & Rubber
 - Microsoft
 - Hewlett Packard
 - IBM
 - Proctor and Gamble
 - Lockheed Martin
 - Monsanto
 - ExxonMobil
 - Corning

- University Partners
 - University of New Mexico
 - Rensselaer Polytechnic Institute
 - Yale University
 - Harvard University
 - Harvey Mudd College
 - University of Wisconsin
 - University of Florida
 - University of Illinois
 - University of California at Davis
 - University of Texas at Austin
 - University of California at Santa Barbara
 - University of Michigan
 - Notre Dame
 - Rice