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SUBMISSION NUMBER:

2011 STEM Award

Section A – Contact Information

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2011 FLC STEM Award

Section B – Nomination Narrative

NINE, THE NATIONAL INSTITUTE FOR NANO ENGINEERING

NINE is a public-private partnership (government/university/industry collaboration) formed to develop the next generation of innovation leaders for the U.S. by involving students – ranging from undergraduates to Ph.D. candidates – in large-scale, multi-disciplinary research projects focused on developing nano-engineering enabled solutions to important national problems. NINE addresses a growing national concern: America's science and engineering education and innovation engine is in danger. The 2007 America COMPETES Act provided a national strategy to address this concern. In accordance with this strategy, Sandia established NINE as a national innovation hub for the exciting, rapidly developing field of nano-engineering. With the nominee, Dr. Regan Stinnett, serving as this STEM initiative's program manager since its birth, NINE has become a model novel partnership with universities and companies throughout the nation and the Department of Energy (DOE), with Sandia as the host lab.

NINE, the only such program in the U.S., is designed to meet all of its partners' needs.

- **Sandia, DOE, and the nation:** Provide innovative nano-engineering solutions to Labs' mission R&D focus areas such as national security problems related to energy and economic security, defense, and workforce development.
- **Universities, their students and faculty:** Provide exciting, real-life and large-scale nano-engineering research opportunities for students and faculty, and access to top research facilities and nationally recognized scientists and engineers.
- **U.S. Industry:** Provide financial leverage for innovative pre-competitive nano-engineering research, intellectual property in key areas, and access to vetted new hires.

This past year under Dr. Stinnett's leadership, NINE developed a formal structure for contractual agreements involving its university and industry partners which ensures continuing funding; has completed an industry/Sandia co-selection of strategic research projects to be undertaken during the next several years; has recorded record numbers of student participants in its year-round and summer programs; has initiated an enhanced collaboration with the National Science Foundation (NSF) that has brought 10 NSF-supported students to Sandia for the summer; and has won the "Deal of Distinction" award from the Licensing Executives Society (U. S. and Canada), Inc.

NINE – Preparing the U.S. for the Future

By Partnering for Workforce Development and Innovation Because the World has Changed

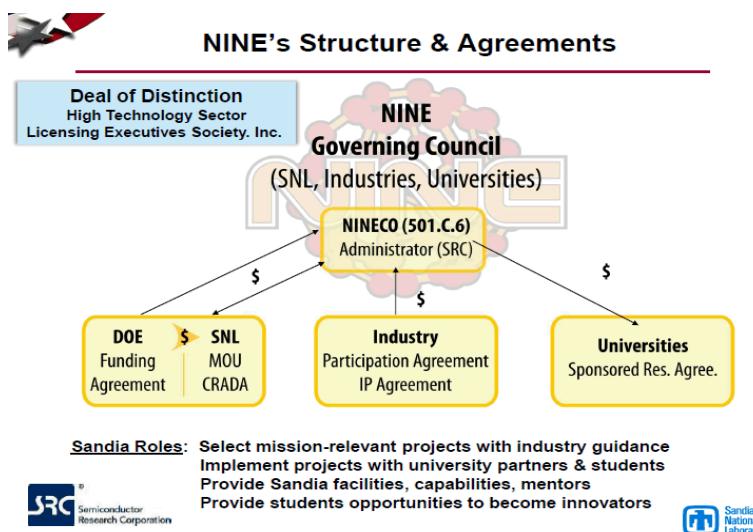
The National Institute for Nano Engineering (NINE) can truly be called a radically different type of science education/technology transfer initiative that, just about three years after its birth, is positioning the U.S. to accelerate innovation by involving an impressive collection of U. S. students in the study of nano-engineering technology, focusing its research on key DOE initiatives, and forging a unique partnership with an impressive roster of industry and academia members.

NINE's roster of industry partners includes Intel, ExxonMobil, and Goodyear as full partners together with other companies who have worked with Sandia to create the NINE concept. Universities that have been involved include Harvard, Harvey Mudd, MIT, Notre Dame, Rice, Rensselaer Polytechnic, Yale and the universities of California-Davis, Florida, Illinois, New Mexico, Texas-Austin, and Wisconsin. Investment in NINE reached \$12M over the past three years, including \$4.6M from DOE, \$6.6M, and \$100K/yr each from industry partners.

NINE's highly collaborative environment matches students with Sandia and industry mentors and university faculty. It capitalizes on DOE's micro/nano R&D equipment and facilities at Sandia and at partners' sites, such as the Labs' Microsystems & Engineering Sciences Applications (MESA) and Center for Integrated Nanotechnologies (CINT) facilities. Graduate students' thesis projects are focused on topics of interest within the NINE research program. Industry partners participate in NINE activities, provide summer internships for students, co-fund research projects, and receive rights to intellectual property resulting from NINE projects. University partners, nationally recognized leaders in nano-engineering research, participate in NINE activities, respond to NINE proposal calls, and provide students and faculty to participate in NINE projects. Sandia contributes its infrastructure base, expertise, and mentors, and helps to identify projects that are strategic to the nation and synergistic with Sandia's strengths. Top students, faculty, and industry researchers collaborate with Sandia, contribute to its knowledge base, and become partners through their NINE projects.

Motivating top undergraduates to obtain advanced degrees is a NINE priority. It supports the selection of promising undergraduates by NINE faculty to participate with graduate students in projects at their university during the academic year. These undergraduates also have opportunities for summer internships in industry or at Sandia.

Among myriad accomplishments for NINE during the past 12 months is Sandia's selection of the Semiconductor Research Corporation (SRC) to manage the administrative and partnership activities of NINE through creation of NINECO, a legal 501.c.6 entity. On the heels of NINECO's establishment, Sandia and SRC were jointly honored with the "Deal of Distinction" presented by the Licensing Executives Society (U.S. and Canada), Inc.



Also completed this past year, was the first Sandia/industry/university partner co-selection of technical projects that will be NINE's focus during the next several years. These projects, with R&D funding totaling more than \$9M, will enable advances in high-value, nano-engineering areas, while providing exciting research opportunities for 36 graduate-level NINE students. The projects involve research into (a) responsive nanocomposites, (b) integration of block-copolymer with nanoimprint lithography, (c) scalable assembly of patterned ordered functional micelle arrays, and (d) self-powered ferroelectric nano-sensors for extreme environments.

Recently Completed NINE Projects Produced Outstanding Technical Nano-Engineering Work

There have been 15 NINE technical projects with more than 60 publications and presentations to date, including the work of 40 students and 26 university faculty. NINE's 2010 summer program – running from early June through early August – boasts the largest enrollment in its four years of operation. Seventeen undergraduates visited the Labs for NINE's annual Nano Expo; twenty-six students, mostly graduate-level, are participating in the summer-long program, which is focusing on nanotechnologies and innovation. For the first time since NINE began, 10 NSF-funded students are also on site participating in "NINE Associate Projects" involving topics such as nanocomposites, nanosensors, and metamaterials.

Technology Innovation Drives Global Leadership and Economic Prosperity, But...

The future of America's innovation engine has been called into question. We face stiff global competition for talent; there have been significant reductions in U.S. industrial research and development; and the rest of the world is closing the technology gap. NINE addresses these challenges head on.

In summary, NINE's goals, which it already is achieving after just four years of operation, are clear:

- Train top graduate students to be global innovation leaders
- Motivate U.S. citizen undergraduates to seek advanced technical degrees
- Excite undergraduates about science and engineering, nanotechnology, and the chance to make a difference
- Find ways to reach out to underserved groups...

...and to achieve all this through work on nationally important, mission-relevant projects that will benefit from involvement of innovative student minds and their national laboratory, university, and industry leaders.



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.