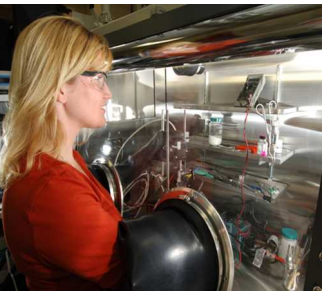
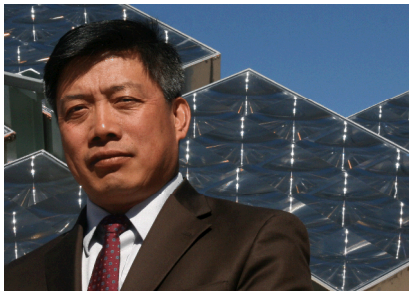
Exceptional service in the national interest

SAND2013-3856C

Sandia National Laboratories




Technology Transfer at Sandia

Peter R. Atherton

Senior Manager, Industry Partnerships

U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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Topics

Tech Transfer Vehicles, Examples

- Tech Transfer of Intellectual Property
- Collaborative Work Agreements
- Economic Development
- Places to collaborate

What's New

- Sandia's new Intellectual Property (IP) initiative
- Hot Technologies
- Ready-to-sign Licenses
- Sandia Science and Technology Showcase

Ideas to Increase Business

Partnerships Mission

“ Our partnerships with industry, academia, and other organizations enable Sandia to share technology for the U.S. public good. While these relationships benefit our partners, they also allow us to deliver on our national security missions and advance the frontiers of science and engineering. ”

Dr. J. Stephen Rottler
Vice President, Science and Technology
Chief Technology Officer
Sandia National Laboratories

Dr. Paul J. Hommert

Sandia President, FLC Lab Director of the Year

"Tech transfer is a Sandia mission requirement. Achieving excellence in our commercialization strategy and management is key to our strategic objectives. We are trusted by the taxpayers to do research and we owe it to them to be strategic about intellectual property and the role it can play in technology transfer. We want to leverage research dollars for economic growth. We have much to offer the country."

Tech Transfer

The process of transferring scientific findings from one organization to another for the purpose of further development and commercialization.

http://www.autm.net/Tech_Transfer.htm

Tech Transfer of Intellectual Property

Sandia National Laboratories

Intellectual Property (IP) – Patents, trademarks, copyrights and comparable property rights protected by Federal Law and other foreign counterparts

Solar Glitter

- **Commercial License –** conveyance of intellectual property rights to a non-Federal partner (licensee) through a license agreement
  - >600 active licenses, >100 royalty bearing
- **Test and Evaluation License** – license outside entities to use, evaluate, and perform research around Sandia technology (can lead to commercialization)
  - >300 from 2010 to Feb. 2013
- **Open Source Software License** – a type of Copyright License making software openly available (no fee) to a licensee for both commercial and noncommercial uses
  - >100 packages
- **Government Use Notice (GUN)** – transference of government-owned IP to a government entity or government contractor to fulfill contract obligations
  - >400 from 2010 to Feb. 2013

Collaborative Work Agreements

- **Cooperative R&D Agreement (CRADA) –** collaborations with one or more non-Federal partners (including small, medium and large companies) to share the results of a jointly conducted research and development project (can involve development and use of IP that may be licensed).
  - >250 CRADAs between FY08-12
- **Umbrella CRADA** – a CRADA that provides a foundation for several projects
  - Examples: Boeing, GE, Lockheed Martin, Goodyear, Raytheon, GM, Monsanto, ITT, Intel, Caterpillar, Northrop Grumman, Proctor & Gamble
  - 16 active

Tire Simulation for Goodyear

- **Funds-In Agreement / Work for Others (WFO) –** perform work on a reimbursable basis for a non-Federal sponsor
  - 700 between FY08-12

Economic Development Programs

- **Sandia Science & Technology Park (S&STP)** – a master-planned 340-acre park home to companies, scientists, and researchers
  - >30 companies, >2400 employees
  - Average salary of $75K
  - Over >4000 indirect jobs created

Sandia Science & Technology Park

- **NM Small Business Assistance (NMSBA)** – allows NM small businesses to access the unique expertise and capabilities of Los Alamos and Sandia national labs
  - $34.3M of technical assistance provided to >2000 small businesses throughout NM since 2000
  - 2000 to 2011 – >2800 jobs created at a mean salary >$38,000
- **Entrepreneurial Separation to Transfer Technology (ESTT)** – an SNL benefit program allowing employees to leave and start up entrepreneurial companies or help expand small businesses that already exist
  - 1994 to 2013 – 145 people left to start 48 companies/expand 50 companies
  - 42 IP licenses, 29 companies became Sandia suppliers

Research Collaboration

- **Combustion Research Facility (CRF)** – a DOE/Office of Science collaborative research facility encouraging the direct involvement of collaborators from the scientific community.
- **Center for Integrated Nanotechnologies (CINT)** – a DOE/Office of Science research center operating as a national user facility by Sandia and LANL devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials.
- **Cyber Engineering Research Institute (CERI)** – a research institute focused on open, exploratory research in cyber security in partnership with academia and industry. Includes:
  - Cyber Engineering Research Laboratory (CERL) in SS&TP
  - Cyber Technology Research Laboratory (CTRL) in Livermore Valley Open Campus

Strategic Partnerships

- **STC.UNM**
  - 100+ inventions jointly owned by SNL and University of NM inventors
  - 60+ commercialization agreements
  - Example - Lotus Leaf Coatings
- **TVC**
  - 19-year partnership
  - $1.3B in venture funding for Lab technologies
  - Entrepreneurial training for Lab Personnel
  - Partner with ESTT and SS&TP

Sandia National Laboratories

Examples

UOP/Honeywell Company

FLC National Tech Transfer Award

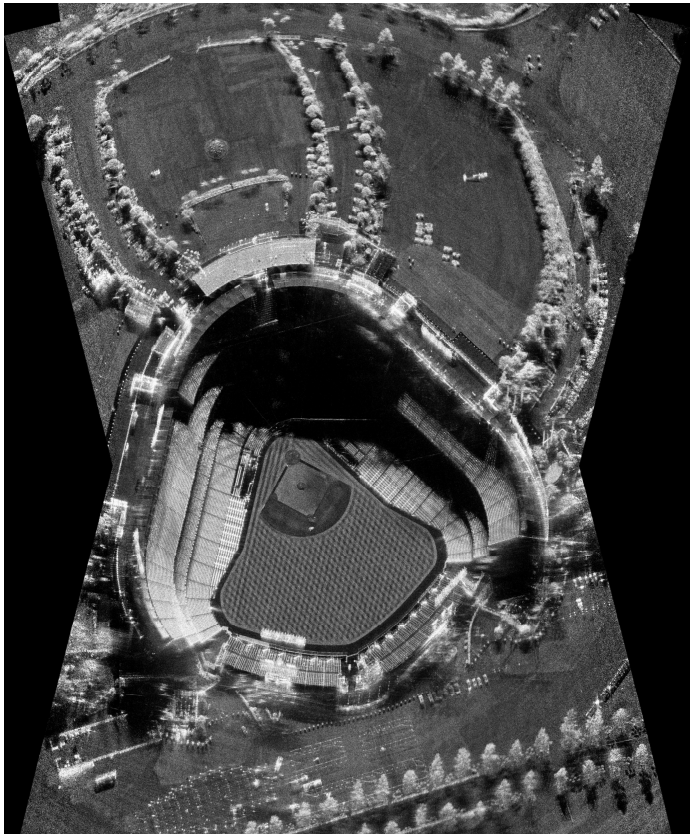
Fukushima Daiichi Nuclear Power Plant Accident

- **Technology**
  - New material: Crystalline silico-titanates (CSTs)
- **Impact**
  - Materials that selectively remove contaminants from aqueous solutions
  - Less costly and safer waste treatment
  - Used at Fukushima Daiichi nuclear power plant for radiation clean-up
- **Tech Transfer Vehicles**
  - CRADA and License

"Honeywell's UOP adsorbents clean 100 million gallons of radiation-contaminated water at Japan's Fukushima Daiichi nuclear power plant"

March 23, 2013 UOP Press Release

General Atomics Aeronautical Systems



SAR image of a baseball field in cloudy conditions

- **Technology**
  - Synthetic Aperture Radar (SAR) systems for U.S. military and other customers
- **Impact**
  - Detailed, high resolution, photograph-like images from an aircraft, night or day, even in foggy, cloudy, or hazy conditions
  - Used by U.S. Air Force and other branches of the military
- **Partnership Mechanisms**
  - GUN, CRADA

Radar engineering, production, and business activities support nearly 700 employees at General Atomics

Wavefront Sciences

Co-founder Dan Neal with laser technology

- **Technology**
  - Improved method for laser corrected vision
- **Impact**
  - >800 units sold worldwide
  - Vision of over 1,000,000 people improved
  - 54 employees
- **Tech Transfer Vehicles**
  - License, ESTT, and TVC

SANDIA SCIENCE & TECHNOLOGY PARK

"The technology originally licensed from Sandia has resulted in significant job creation in New Mexico, and, since the majority of products were sold in Europe, an improvement in our balance of trade," says co-founder Dan Neal.

Team Technologies

Stingray destroys propane tank with a blade of water

- **Technology**
  - Water-Based Explosives Disruptor (aka Stingray)
- **Impact**
  - >8000 sold
  - Deployed to warfighters and first responders
  - Saving lives in war zones
- **Tech Transfer Vehicles**
  - License, SS&TP

SANDIA SCIENCE & TECHNOLOGY PARK

EFT Holdings

Sandia researcher demonstrates how foam works

- **Technology**
  - Decontamination foam
- **Impact**
  - Renders chemical and biological agents harmless
  - Used to decontaminate risk areas during anthrax attacks
  - Meth lab cleanup
  - Mold and pesticide removal
- **Tech Transfer Vehicles**
  - License, CRADA

Black-I Robotics

GEMINI-Scout Mine Rescue Robot

- **Technology**
  - Unmanned ground vehicle
  - Dual track chassis design to travel over obstacles
  - Outfitted with cameras, microphones, and sensors
- **Impact**
  - Can help save lives in mine disasters
- **Tech Transfer Vehicle**
  - License

GE Global Research

- **Technology**
  - Distributed Energy Technologies Laboratory photovoltaic (PV) array
- **Impact**
  - Evaluation of a PV converter designed to help large commercial and utility scale PV plants become more energy efficient
- **Tech Transfer Vehicle**
  - Umbrella CRADA, License

Testing GE's new converter will help GE evaluate its commercial viability and potential.

Photovoltaic array

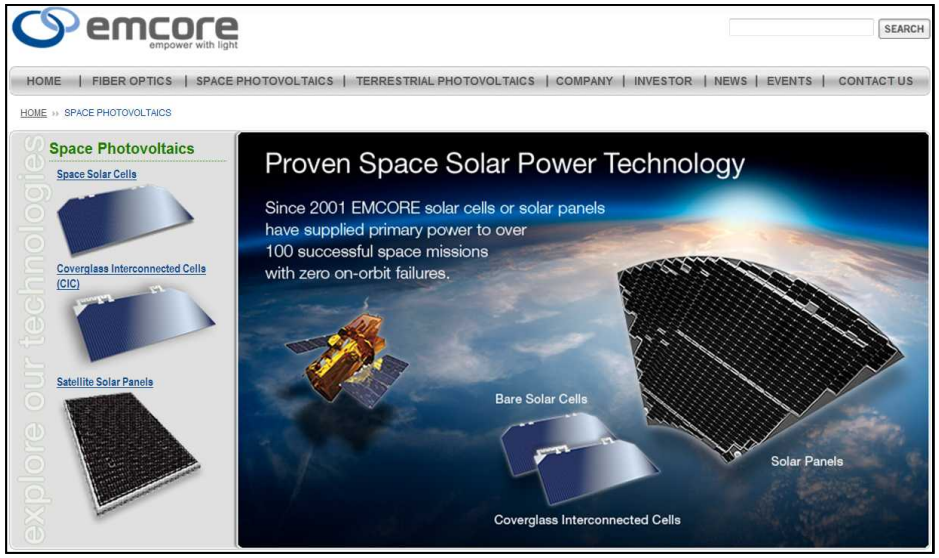
EMCORE

SANDIA SCIENCE & TECHNOLOGY PARK

Sandia National Laboratories

- **Technologies**
  - VCSEL
  - Solar cell
  - Transponder
- **Impact**
  - First to move into SS&TP
  - Publicly traded company
  - 300+ employees
- **Tech Transfer Vehicles**
  - SS&TP, CRADA, Licenses
  - Engaged with LDRD team
  - Building new solar farm at SS&TP

EMCORE's CEO is a former Sandian



Non-Explosive Fertilizer

- **Technology**
  - A fertilizer with a different formulation that will not explode
- **Potential Impact**
  - Reduce IEDs in war zones and USA
  - Mitigate the circumstances that led to the Texas fertilizer plant explosion
  - Startup company
- **Tech Transfer Vehicle**
  - Publication was chosen as the fastest vehicle to transfer this technology for the public good
  - Sandia's widest transfer of technology is through publication

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Sandia develops nonexplosive fertilizer

By Olivier Uyttebrouck / Journal Staff Writer on Tue, Apr 23, 2013

Farmers the world over use ammonium nitrate fertilizer to improve their crop yields, but the same raw material also is used to make deadly homemade bombs.

A Sandia National Laboratories engineer who helped train U.S. soldiers in disarming roadside bombs has developed a nonexplosive form of the fertilizer that he said also offers added benefits for farmers.

The formula also has the potential to improve industrial safety. The cause of a fire that set off an explosion last week at a Texas fertilizer plant remains unknown, but a 2012 report showed the plant stored at least 270 tons of ammonium nitrate.

Sandia chemical engineer Vicki Chavez works with engineer Kevin Fleming. (Photo Courtesy Randy montoya/ sandia national laboratories)

Albuquerque Startup – Dr. Forman

Dr. Forman and SNL researcher examine trauma shears

- **Technology**
  - Ruggedized medical trauma shears able to slice through tough materials, such as denim and leather, faster and easier
- **Impact**
  - Help emergency personnel get to injuries more quickly
  - Dr. Foreman plans to market the shears through his Albuquerque startup
- **Partnership Mechanism**
  - NMSBA

Midiwing

Technology

- MidiWing is a small box containing circuitry with several inputs that connect to switches and sensors, such as a joystick, mouse, slider or fader, that produce sound when moved.

Impact

- Help people with limited physical abilities to play music

Partnership Mechanism

- NMSBA

KOB Albuquerque News Report

http://www.kob.com/article/stories/S2928247.shtml?cat=500

New Mexico Small Business Assistance Program (NMSBA) – Joint Sandia/LANL Program Results

Sandia National Laboratories

NMSBA Metrics	2000-2012	2011	2012
Number of Small Businesses Served	2036	340	349
Number of Counties Supported (out of 33)	33	27	27
Value of Assistance Provided	$34.3M	$4.6M	$4.5M

NMSBA Accountability & Economic Impact	2000-2011*
Return of Investment (ROI)**	1.18
Small Business Jobs Created and Retained	2,874
Mean Salary	$38,647
Increase in Revenue	$145,254,992
Decrease in Operating Costs	$72,644,271
Investment in NM Goods and Services	$43,325,007
New Funding/Financing Received	$52,334,828

*Surveys are performed six months to one year after project completion
**ROI is based on salaries of jobs created and retained

New study to see where technology was commercialized and its impact; eventually create a video of personal stories

Sandia Science & Technology Park

Sandia National Laboratories

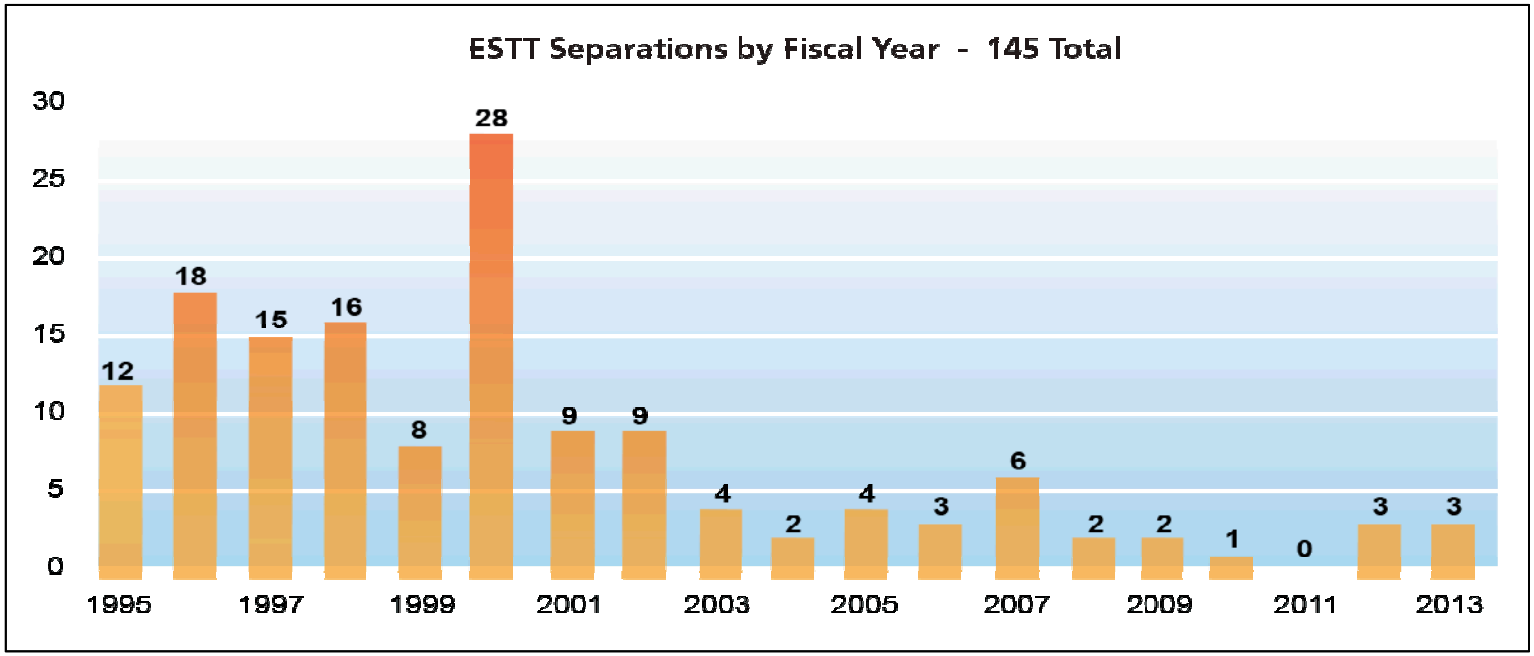
Overall	
Number of Companies	33
Number of Employees	2474
Number of Buildings	23
Acreage Developed (out of 338.5)	106
Square Feet of Available Space	92,917
Square Feet of Occupied Space	1 Million
Funds In to Sandia from Park Companies since 1998	$17.7 Million
Contracts from Sandia Procurement to Park Companies since 1998	$390 Million
Contracts between Park Companies since 1998	$9.4 Million
Public and Private Investment in the Park since 1998	
Public	$86.6 Million
Private	$263.9 Million
Total	$350.5 Million

Sandia Science & Technology Park

Sandia National Laboratories

Jobs Created	
Direct Jobs Created by Entities in the Park	2,470
Indirect Jobs Created as a Result of the Park	4,123
Total Jobs Created (Direct Plus Indirect)	6,593
Increase in Tax Revenue	
Cumulative Impact on Taxable Consumption (Goods and Services)	$1,893,200,000
Cumulative Impact on Gross Receipts Tax Revenue to the State of New Mexico	$73,400,000
Cumulative Impact on Gross Receipts Tax Revenue to City of Albuquerque	$10,400,000
Increase in Wages	
Cumulative Increase in Wage and Salary Disbursements Attributable to Park Activities	$3,062,800,000
Salary Comparison	
Average Salary for Each Full-Time Job in the Park	$74,949
Average Salary for Each Full-Time Job in Albuquerque	$42,332

ESTT Metrics



ESTT Metrics	
Sandia scientists and engineers who left on ESTT	145
To start-up companies	62 (42%)
To expand companies	83 (58%)
Companies impacted by ESTT	**99**
Start-ups	47
Expansions	52
Licenses for Sandia IP with ESTT	42
ESTT companies that became Sandia suppliers	29

Additional IP Mechanisms

- **SBIR/STTR Tech Transfer Initiative**

  DOE Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Initiative funding mechanisms enable small companies to leverage technology developed at DOE national laboratories.

- **Startup America**

  A White House initiative to support and encourage entrepreneurship throughout the nation.

- **Energy Innovation Portal**

  DOE website that provides access to patents and published patent applications for the 17 DOE labs. Provides showcase descriptions of over 600 technologies available for licensing.

What's New

To Increase Tech Transfer

Sandia's IP Initiative

- **Strategy**
  - Earlier consideration of IP in the R&D process
  - Earlier engagement of external entities in the IP lifecycle process
  - More thoughtful deployment of IP when making business arrangements

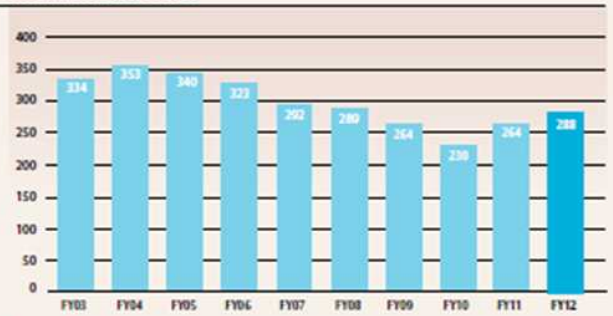
- **Vision** – IP is part of what we do, and not an initiative
  - Integral to Research Planning
  - Amplifies Mission Impact
  - A natural part of our culture

- **Impact**
  - IP that is more aligned with strategy and partner needs
  - Stronger IP portfolio for proposals
  - Partners better aligned for tech transfer
  - Stronger commercializing for public good

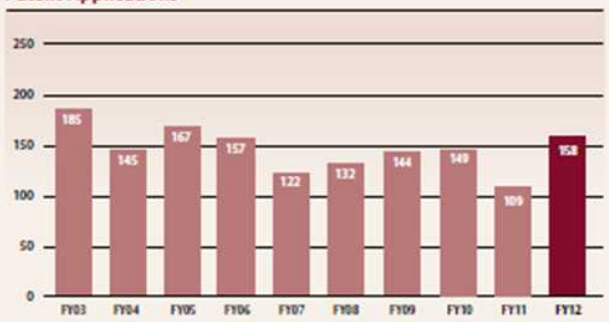
Positive Indicators

Patent Activity

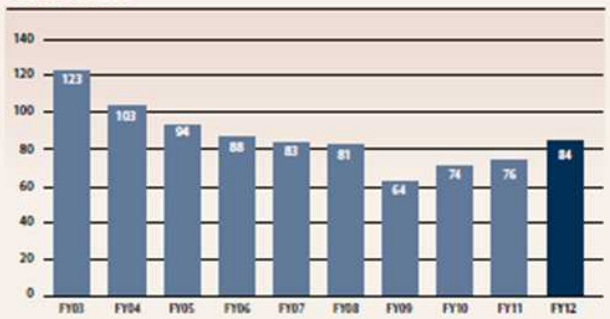
Invention Disclosures



Patent Applications

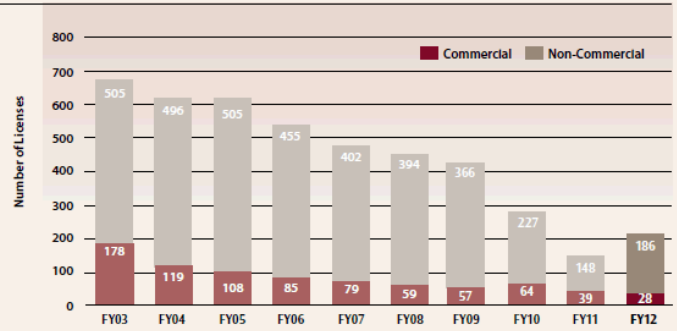


Patents Issued

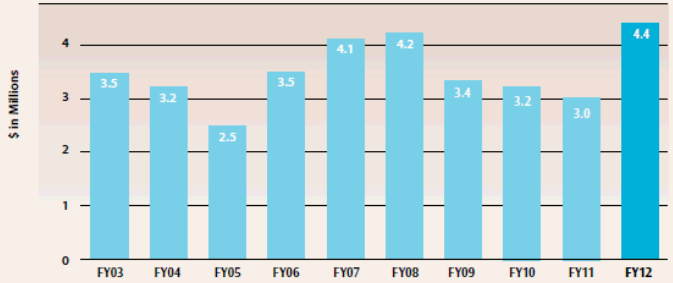


Licenses

Licenses

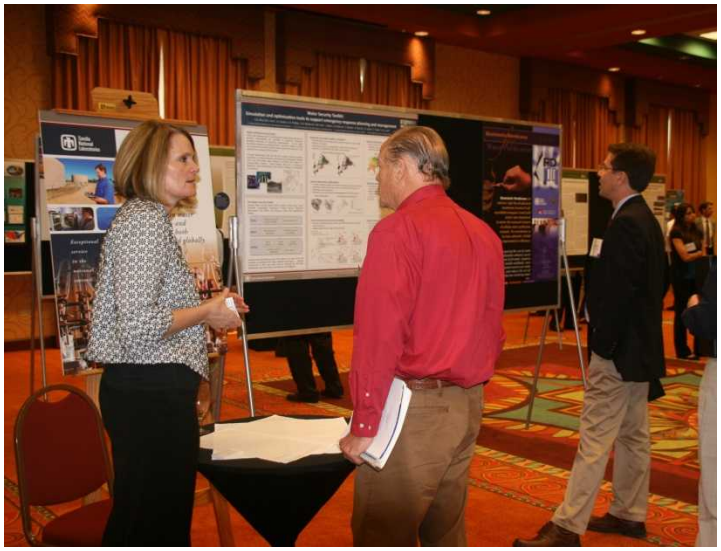


Licensing Income ($M)



2012: First Annual Sandia Science and Technology Showcase

- Directly connected SNL scientists/engineers with potential partners
- Content
  - 41 posters in four themes - cyber research, nano & microsystems, energy security, and water security
  - 16 speakers, 3 panels
  - 6 Sandia booths and 4 sponsor booths
- Attendance
  - 380 attendees including industry representatives from 11 states
- Produced
  - 21 new NMSBA prospects
  - 4 new Park prospects
  - 1 sign-and-drive license
  - Multiple supplier and partner prospects



Ready-to-Sign Licenses

https://ip.sandia.gov/readyToSignLicenses.xhtml

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Ready-to-Sign Licenses

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definition will be unique to each license. Some will be paid-up upon rec
royalty payment for sales of licensed product, or an annual use fee. The
services, including payment of patent maintenance fees. A portion of the
for additional R & D within the lab.

Title	
Chemical Free Water Analysis with Nanoelectrode Arrays	
Correlation Spectrometer	
Hedgehog™ Water Contaminant Removal System	
Spherical Joint Technologies	
Micromechanisms with Floating Pivot	
Frequency Modulation Drive for a Piezoelectric Motor	03/29/2013

Sandia National Laboratories

HEDGEHOG™ CONTAMINANT REMOVAL SYSTEM

TECHNOLOGY READINESS LEVEL 7

PROTOTYPES HAVE BEEN TESTED AND SHOWN TO WORK IN AN OPERATIONAL ENVIRONMENT

US PATENT # 7,514,004

TECHNOLOGY SUMMARY

The 'hedgehog' is an in-tank recirculating treatment system designed to reduce the levels of a variety of organic and inorganic contaminants in water storage tanks. The hedgehog works by utilizing a recirculation pump that continually sends water though a treatment module to reduce the levels of contamination.

Originally developed for arsenic decontamination, this in-tank filtration device has been extensively tested on small water systems (~100 connections or less) with ambient arsenic (As) levels of 11-25 ppb. Results of this testing indicate that the system can routinely achieve low cost compliance with the new US arsenic limit of 10 ppb. The smaller scale, greater efficiency, and reduced cost of this filtration system make it a viable option of small tank owners and communities. The annual cost for the Hedgehog™ is approximately 1/3 of the GIM option. Estimates indicate similar results and costs are achievable for a variety of other types of contaminants.

POTENTIAL APPLICATIONS

- Water treatment
- Ideal for use in smaller community water tanks or personal water tanks

TECHNOLOGICAL BENEFITS

- Highly effective in treating arsenic-contaminated systems; can be expanded to filter other contaminants
- Less costly than traditional removal systems
- Commercially available components with unique design

TECHNOLOGY INQUIRY?

For more information or licensing opportunities contact us at

ip@sandia.gov

Refer to SD # 10055

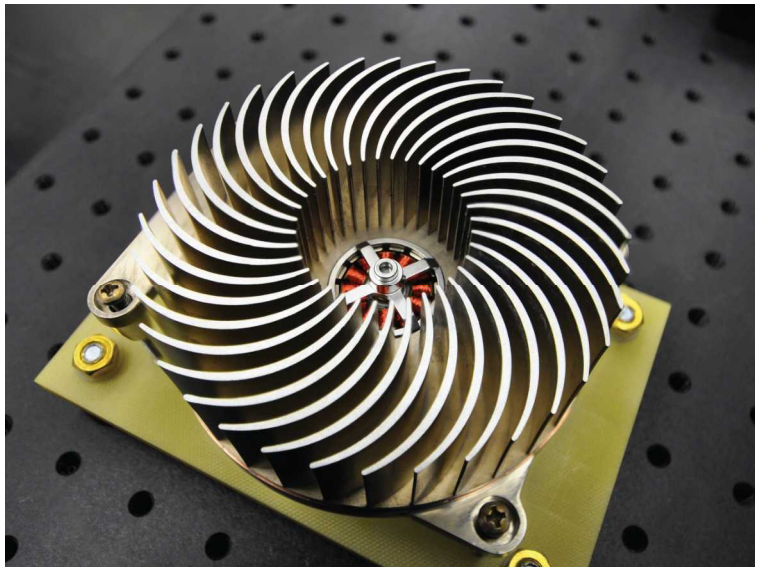
or

https://ip.sandia.gov

NNSA | Page 1 (1 of 1) | U.S. DEPARTMENT OF ENERGY

Hot Technology - Sandia Cooler

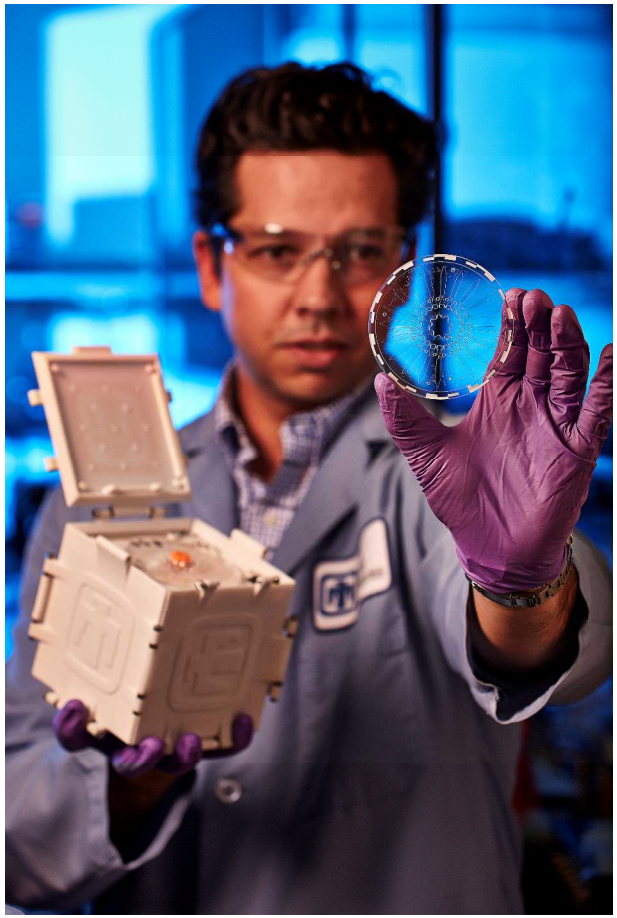
- **Technology**
  - Fundamental breakthrough in heat transfer
  - Small, quiet unit provides dramatic cooling performance, high thermal efficiency, and superior resistance to dust
  - Applications from laptop and desktop computers to HVAC
- **Opportunity**
  - 5 licenses in negotiation
  - 12 companies waiting for prototypes
  - 50 company inquiries
- **DOE continues to invest**
  - In electronics applications
  - Scale up design for HVAC applications



R&D 100 Award Winner

Electronics applications include notebook & desktop PCs, portable computing systems, server, networking equipment, power electronics, high resolution displays & cameras, projection systems, gaming systems, medical imaging systems, telecommunications, avionics, radar systems, test equipment, energy storage systems, LED lighting, appliances, and automotive applications including lighting, batteries and infotainment systems.

Hot Technology - SpinDX



- **Technology**
  - Portable, cost-effective and efficient device capable of testing up to 64 assays on a single disc in under 15 minutes from a single drop of fluid.
- **Opportunity**
  - 2 current licenses - 1 Medical, 1 Law Enforcement
  - 3 additional companies in licensing discussions
  - Broadly applicable – from cardiac markers to infectious diseases to food and water safety

Hot Technology – Enhanced Oil Recovery

- **Technology**
  - Provides water-flood chemistry to improve oil recovery from existing wells
  - Applications are specific to geological formations – *sandstone, limestone, shale*
  - Economic analysis of water-flood chemistry in geology/geography applications is an industry interest

- **Opportunity**
  - Two pending industry partners
  - One additional company has expressed interest
  - May increase the percentage of oil extracted, thereby extending the life of a well

Hot Technology - Sandia Hand

- **Technology**
  - Low-cost modular hand with interchangeable fingers
  - Can be tailored to suit a wide variety of applications requiring high dexterity
  - Fingers and other tools (flashlights, screwdrivers, cameras) can be quickly and easily attached
  - Can position and re-socket detached fingers independently without the need for operator engagement
- **Opportunity**
  - 7 companies have expressed interest in licensing the technology in diverse fields of use.
  - Can be used in disarming improvised explosive devices (IEDs)

Hot Technology - Protocell

University of New Mexico Partnership

SNL researcher works with a Protocell solution

- **Technology**
  - A hybrid particle made up of a lipid membrane and a porous silica nanoparticle core, the Protocell combines key properties of each material.
- **Impact**
  - A novel targeted nanoparticle called a Protocell which can more effectively deliver drugs to targeted cancer cells
  - The Protocell is also the ideal vehicle to deliver the custom drug combinations needed for personalized medicine
- **Tech Transfer Vehicle**
  - Collaboration between Sandia, the University of New Mexico (UNM), and the UNM Cancer Research and Treatment Center.

Ideas to Increase Business

- **Clone NMSBA program** in other states with national laboratories
  - Encourage further economic development using intellectual property from all DOE laboratories
- **DOE strategic investment fund** to advance selected technologies from research to commercial proof-of-concept
  - Similar to recent DOE investment in Sandia Cooler technology
- **Leverage existing Sandia programs** (SS&TP, NMSBA, ESTT) to help attract companies to NM
  - Target out-of-state companies that have licensed Sandia technology
- **A place in SS&TP** to enhance Sandia's ability to collaborate and commercialize
  - Partner with TVC and other NM research institutions
  - Technology incubation and maturation, partner offices , showcase, large conference space